未踏数学の開拓と情報発信の高度化

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(課題番号　15204003)

平成15年度～平成18年度科学研究費補助金(基盤研究(A))
研究成果報告書

平成19年3月

研究代表者　西川　青季
(東北大学大学院理学研究科教授)

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目 次

1 はしがき

二十世紀において，数学は理工学や情報科学など自然科学の諸分野のみならず，医学・経済学・心理学などの分野においても必要不可欠な研究手段となり，これらの諸科学を結びつける要（共通の研究手段）として重要な役割を果たしてきた．数学のこのような役割は，二十一世紀に入り益々その重要性を増してきている．

このような状況の下，基礎科学としての数学の研究においては，二十世紀の研究における極度な抽象化や過度な分業化を避け，科学技術や社会科学における応用を見据えた研究を，既存の理論の枠組みを越え総合的に推進することが喫緊の課題となっている．

いいかえると，二十世紀後半に残された未解決問題や，二十一世紀の諸科学を結びつける要となる新理論（以下これらを未踏数学とよぶ）を，創始・開拓することが緊急の課題となっている．本研究課題は，現在世界の第一線で指導的立場にある研究者を，個々の専門分野の境界を越えて有機的に結集し，共同研究や研究情報の交換を集約的に行うことにより，このような未踏数学の研究の基盤を築くことを目的に遂行された．

とくに，**Advanced Studies in Pure Mathematics** のシリーズの刊行を軸に，わが国で得られたこのような未踏数学に関する研究成果を，高度な研究情報として迅速に世界に発信し，基礎科学としての数学の新しい展開に向けて，問題提起を継続的に行うことを目指した．

この目的のために，本研究課題で行った主要なプロジェクトは次の通りである．

1. 未踏数学の開拓に関して
   (a) 4 つの国際研究集会の開催
   (b) 4 つの国内研究集会の支援
   (c) 「21 世紀の数学 ―幾何学の未踏峰―」の出版
2. 情報発信の高度化に関して
   (a) 12 の国際研究集会のプロシーディングスの刊行
   (b) 数学ジャーナルの電子化を推進するためのワークショップの開催
   (c) Advanced Studies in Pure Mathematics のホームページの整備
   (d) Advanced Studies in Pure Mathematics のオンライン編集システムの整備
   (e) Advanced Studies in Pure Mathematrics の既刊分のデジタル化
   (f) Advanced Studies in Pure Mathematrics のクラスファイルの作成
   (g) 幾何学分科会のホームページの整備とサーバーの更新

これらのプロジェクトを通して，個々の専門領域や大学組織間の境界を越えた研究を推進し，わが国における数理科学の研究の進展と，この分野での国際貢献および研究成果の発信に貢献することが出来た．

本研究課題の遂行にあたり，研究分担者として協力いただいた方々，またそれぞれのプロジェクトの責任者となっていただいた方々に，深く感謝いたします．

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2 研究組織

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3 交付決定額

(金額単位：千円)

	直接経費	間接経費	合計
平成 15 年度	9,400	2,820	12,220
平成 16 年度	7,900	2,370	10,270
平成 17 年度	8,500	2,550	11,050
平成 18 年度	9,000	2,700	11,700
総計	34,800	10,440	45,240

4 研究成果概要

4.1 平成15年度

1. 未踏数学に関する研究プロジェクト「フィンスラー多様体への調和写像の理論の構築」を立ち上げ，平成15年8月から9月にかけて東北大学において共同研究を行い，その成果をもとに平成16年3月4日から3月7日にかけて国際研究集会「Workshopon Differential Geometry」を開催した．

2. 平成15年8月に開催された「第50回微分幾何学シンポジウム」のプロシーディングスを編集した．

3. Advanced Studies in Pure Mathematics, Volume 33 から Volume 37 を，国内外の22研究機関に寄贈した．

4. わが国から多くの重要な学術雑誌が数学分野において発行されているが，その電子ジャーナル化は遅れている．このような現状を打開するため，国立情報学研究所ならびに東北大学付属図書館および同大学院理学研究科数学専攻と共催で，数学分野の学術雑誌の電子ジャーナル化を促進するための研究集会「Workshop on Project Euclid」を，平成16年1月に東北大学において開催した．図書館関係者を含め国内の主要な数学雑誌編集担当者54名が参加した．

4.2 平成16年度

1. 幾何解析学の分野で目覚しい業績を上げている国内外の若手研究者を招聘し，未解決問題の今後の展望を検討するための国際研究集会「Workshop on Geometric Analysis」を，平成16年2月21日から24日にかけて東北大学において開催した．

2. 幾何学の分野における未解決問題をまとめた「21世紀の数学－幾何学の未踏峰」を編集し，出版した．

3. Advanced Studies in Pure Mathematics, Volume 38 から Volume 42 を刊行し，国内外の22研究機関に寄贈した．

4. Advanced Studies in Pure Mathematics のホームページを整備した．

5. 数学の学術雑誌においては，電子ジャーナル化だけではなく，バックファイルについても遡及的にデジタル化しインターネット上で自由に利用できるように公開することが喫緊の課題である．そこで東北大学付属図書館および同大学院理学研究科数学専攻と共催で，研究集会「Open Forum on Digital Publication and Digital Library」を，平成17年1月に東北大学において開催した．

6. 第51回幾何学シンポジウムの開催を支援した．

4.3 平成17年度

1. Advanced Studies in Pure Mathematics シリーズの編集作業をオンライン上で行うためのシステムとして,「PDF Web 配信システム」を構築した.

2. 第3回日仏特異点シンポジウムのプロシーディングス「Singularities in Geometry and Topology-Sapporo 2004」を Advanced Studies in Pure Mathematics シリーズから出版するため,最終原稿の TeX 入力を行った.

3. Advanced Studies in Pure Mathematics シリーズの既刊 42 巻のうち,初期に出版されたものは現在すでに入手不可能な状態にある.これら初期に出版されたものを pdf ファイルとしてデジタル化し,インターネット上で利用できる形に整えた.

4. 幾何学の分野における研究情報の発信を高度化するため,研究者メーリングリストおよびウェブサイトとして利用されている幾何学分科会のホームページのサーバーを更新し,ホームページのデザインを一新するとともに,英語版ホームページを立ち上げた.

5. 複素フィンスラー幾何学の他分野への応用に関する総合研究「複素フィンスラー幾何学とその応用」を推進するため,研究集会「Differential Geometry, Sendai 2006」を,平成 18 年 2 月 9 日に東北大学において開催した.

6. 部分多様体論の分野における未解決問題を検討するため,研究集会「部分多様体論・湯沢 2005」を,平成 17 年 11 月 23 日から 11 月 25 日にかけて開催した.

7. 第 52 回幾何学シンポジウムの開催を支援した.

4.4 平成18年度

1. Advanced Studies in Pure Mathematics シリーズの編集作業の効率化を図るため,TeX による原稿入力のガイドラインを更新し,そのためのクラスファイルを新規に作成した.

2. Advanced Studies in Pure Mathematics, Volume 43 から Volume 46 を刊行し,国内外の 22 研究機関に寄贈した.

3. 第3回日仏特異点シンポジウムのプロシーディングス「Singularities in Geometry and Topology-Sapporo 2004」(ASPM 第 46 巻) を完成し,国内外の 30 研究機関に寄贈した.

4. 未踏数学に関する研究プロジェクト「フィンスラー多様体への調和写像の理論の構築」を推進するため,研究集会「Geometric Analysis, Sendai 2007」を,平成 19 年 1 月 13 日から 1 月 15 日にかけて仙台国際センターにおいて開催した.

5. 部分多様体論の分野における未解決問題を検討するため,研究集会「部分多様体論・湯沢 200」を,平成 18 年 11 月 29 日から 12 月 1 日にかけて開催した.

6. 幾何学の分野における研究情報の発信を高度化するため,研究者メーリングリストおよびウェブサイトを管理している幾何学分科会のサーバーの更新を完成した.

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8. J. Noguchi (with K. Miyajima, M. Furushima, H. Kazama, A. Kodama, T. Ohsawa, H. Tsuji and T. Ueda (Editors)),Proceedings of OKA 100 Conference Kyoto/Nara 2001, Adv. Studies Pure Math., Japan Math. Soc., 2004, 345pp.
9. 野口潤次郎, 多変数ネヴァンリンナ理論とディオファントス近似, 共立出版社, 2003, 264pp.
10. S. Mukai, An Introduction to Invariants and Moduli, Cambridge University Press, 2003, 502pp.

6 研究集会

6.1 「Workshop on Differential Geometry at Matsushima」記録

「Workshop on Differential Geometry at Matsushima」のご案内

平成15年度科学研究費補助金（基盤研究(A)(1)「未踏数学の開拓と情報発信の高度化」（研究代表者 西川青季））の研究計画の一環として下記要領でワークショップを開催しますので，ご案内申し上げます．

日程： 3月4日（木）-3月7日（日）

会場： ホテル松島大観荘

（宮城県宮城郡松島町字犬田10-76 ・電話022(354)2161（代））

交通アクセス

JRの場合　仙台駅にて仙石線（地階）へ乗り換え．下り石巻方面の電車に乗車し「松島海岸駅」下車．仙台-松島海岸間は快速で約30分，普通で40分．料金は片道400円．なお，新幹線中央出口へ向かわれますと，改札を出ることなく乗換えができます．仙台駅構内図のURLを下に記しますので乗り換えの際のご参考にしてください．
http://www.ecomo-rakuraku.jp/guide/21044.html

空路の場合　仙台空港から，

(1) 仙台空港バスターミナル3番のりばより，松島行きの定期バス（日本三景交通）にて「松島海岸駅」降車．仙台空港-松島海岸駅間は約60分-70分．料金は片道1,500円（3日前までに予約が必要．電話022-354-5151）．バスの運行時刻等については下記URLをご参照ください．
http://www.tabi-bus.co.jp/main.htm

(2) 仙台空港バスターミナル1番のりばより，エアポートリムジンバスにて仙台駅で一旦降車（仙台空港-仙台駅間約40分）．料金は片道910円．その後はJR仙石線（上述）で松島海岸駅下車．

JR仙石線「松島海岸駅」からホテルまでは，14:00-18:00の時間帯であれば，電車の到着時刻にあわせて送迎バスが待機していますのでご利用ください．

ホテルに関するその他の情報につきましては下記URLをご参考ください．
http://www.taikanso.co.jp/

世話人: 上野慶介 (山形大学理学部), 鎌田博行 (宮城教育大学教育学部)

Program

March 4(Thu.) [Room: Suehiro]

15:15–15:45	Registration
15:45–16:00	Opening Meeting
16:00–17:00	Udo Simon (TU berlin) Centro-affine Bernstein problem
17:00–17:30	Discussion/Break

March 5(Fri.) [Room: Suehiro]

9:30–10:30	Paul Baird (University of Brest) Einstein metrics, harmonic morphisms and biconformal deformations
10:30–11:00	Discussion/Break
11:00–12:00	Shin Nayatani (Nagoya University) Combinatorial harmonic maps and discrete-group actions on CAT(0) spaces
12:00–12:30	Discussion/Break
12:30–14:00	Lunch
14:00–15:00	Takashi Kurose (Fukuoka University) Geometry of statistical manifolds
15:00–15:30	Discussion/Break
15:30–16:30	Udo Simon (TU Berlin) Relative hypersurface theory revisited: Gauge invariant structures
16:30–17:00	Discussion/Break
17:00–17:30	Hiroshi Matsuzoe (Saga University) Traceless cubic forms on statistical manifolds and conformal-projective geometry
17:30–18:00	Discussion/Break

March 6(Sat.) [Room: Godai]

9:30–10:30	Seiki Nishikawa (Tohoku University) Harmonic maps in complex Finsler geometry
10:30–11:00	Discussion/Break
11:00–12:00	Tadashi Aikou (Kagoshima University) Projectively-flat complex Finsler metrics
12:00–12:30	Discussion/Break
12:30–14:00	Lunch
14:00–15:00	Tom Wan (Chinese University of Hong Kong) Hyper-Lagrangian submanifolds in hyper-Kaehler manifolds and mean curvature flow
15:00–15:30	Discussion/Break
15:30- 16:30	Paul Baird (University of Brest) Evolution of the scalar curvature of a surface to a prescribed function
16:30–17:00	Discussion/Break
17:00–17:30	Keisuke Ueno (Yamagata University) Eigenmaps and immersions between spheres
17:30–18:00	Discussion/Break

March 7(Sun.)

9:30 10:00	Closing Meeting

Workshop on Differential Geometry
at Matsushima
March 4–7, 2004

List of Participants

Tadashi Aikou(Kagoshima University)

Paul Baird(University of Brest)

Hitoshi Furuhata(Hokkaido University)

Jun-ichi Inoguchi(Utsunomiya University)

Hiroyasu Izeki(Tohoku University)

Hiroyuki Kamada(Miyagi University of Education)

Takashi Kurose(Fukuoka University)

Koji Matsumoto(Yamagata University)

Hiroshi Matsuzoe(Saga University)

Adela Mihai(University of Bucharest(Yamagata University))

Shin Nayatani(Nagoya University)

Seiki Nishikawa(Tohoku University)

Udo Simon(TU Berlin)

Keisuke Ueno(Yamagata University)

Tom Wan(Chinese University of HongKong)

6.2 「Workshop on Project Euclid」記録

Workshop on Project Euclid : January 23, 2004

Program

Venue: Conference Room (Room #501), 5th floor, Aoba Memorial Hall, Tohoku University

Friday January 23, 2004

14:00 Opening - Mr. OBA, NII
Welcome - Professor ADACHI, NII

14:10 SPARC/JAPAN - Professor ADACHI, NII

14:30 Project Euclid - Mrs. Teresa EHRING, Director of Electric Publishing, Cornell University
Mr. David RUDDY, Interim Coordinator, Cornell University

15:45 SPARC/JAPAN PARTNERS - Professor NISHIKAWA, Tohoku University
Professor FUTAKI, Tohoku University

16:00 Q & A

16:45 closing

17:00 Welcome Party (Room #702), 7th floor, Aoba Memorial Hall

Project Euclid 説明会：2004 年 1 月 23 日

プログラム

会場：東北大学 青葉記念会館 5 階 大会議室（501）

2004 年 1 月 23 日（金）

14:00 開会 － 大場課長（NII）
挨拶 － 安達教授（NII）

14:10 SPARC/JAPAN 事業の紹介 － 安達教授（NII）

14:30 Project Euclid 紹介 － テレサ・イーリング氏（コーネル大学）
デイビッド・ラディ氏（コーネル大学）

15:45 2003 年度 SPARC/JAPAN 選定誌から － 西川教授（東北大学）
二木教授（東京工業大学）

16:00 質疑

16:45 閉会

17:00 懇親会（会場：青葉記念会館 7 階 702）

Workshop on Project Euclid : January 23, 2004

List of Participants

Venue: Conference Room (Room #501), 5th floor, Aoba Memorial Hall, Tohoku University

出席者	Participants
行木 孝夫 北海道大学理学研究科助手	Mr. NAMIKI **Takao**, Professor, Graduate School of Science, Hokkaido University *Hokkaido Mathematics Journal*
阿部 綾子 北海道大学大学理学研究科	Ms. ABE **Ayako**, Professor, Graduate School of Science, Tohoku University *Hokkaido Mathematics Journal*
保科 隆雄 筑波大学数学系教授	Mr. HOSHINA **Takao**, Professor, Institute of Mathematics, University of Tsukuba *Tsukuba Journal of Mathematics*
気谷 陽子 筑波大学図書館部情報管理課課長補佐	Ms. KITANI **Yoko**, Library, University of Tsukuba
長澤 壯之 埼玉大学理学部教授	Mr. NAGASAWA **Takeyuki**, Professor, Faculty of Science, Saitama University *Saitama Mathematical Journal*
倉橋 とき子 埼玉大学附属図書館情報管理課雑誌情報係長	Ms. KURAHASHI **Tokiko**, Library, Saitama University
京藤 貫 千葉大学附属図書館情報管理課長	Mr. KYOTO **Tooru**, Library, Chiba University
片岡 清臣 東京大学数理科学研究科教授	Mr. KATAOKA **Kiyoomi**, Professor, Graduate School of Mathematical Sciences, University of Tokyo *Journal of Mathematical Sciences, the University of Tokyo*
高橋 努 東京大学附属図書館総務課企画渉外掛長	Mr. TAKAHASHI **Tsutomu**, Library, University of Tokyo
二木 昭人 東京工業大学理工学研究科教授	Mr. FUTAKI **Akito**, Professor, Graduate School of Science, Tokyo Institute of Technology *Kodai Mathematical Journal*
三好 重明 中央大学理工学部	Mr. MIYOSHI **Shigeaki**, Professor, Graduate School of Science, Chuo University *Tokyo Journal of Mathematics*
一楽 重雄 横浜市立大学総合理学研究科教授	Mr. ICHIRAKU **Shigeo**, Professor, Graduate School of Integrated Science, Yokohama City University *Yokohama Mathematical Journal*
竹内 照雄 新潟大学理学部助教授	Mr. TAKEUCHI **Teruo**, Associate Professor, Faculty of Science, Niigata University *Nihonkai Mathematical Journal*

木村 巌 富山大学理学部助手	Mr. KIMURA **Iwao**, Research Associate, Faculty of Science, Toyama University *Mathematics Journal of Toyama University*
木村 優 富山大学附属図書館情報サービス課長	Mr. KIMURA **Masaru**, Library, Tohoku University
小崎 和子 名古屋大学多元数理科学研究科	Ms. KOZAKI **Kazuko**, Graduate School of Mathematics, Nagoya University *Nagoya Mathematical Journal*
竹井 義次 京都大学数理解析研究所助教授	Mr. TAKEI **Yoshitsugu**, Associate Professor, Research Institute for Mathematical Sciences, Kyoto University *Publications of the Research Institute for Mathematical Sciences*
伊吹山 知義 大阪大学理学研究科教授	Mr. IBUKIYAMA **Tomoyoshi**, Professor, Graduate School of Science, Tohoku University *Osaka Journal of Mathematics*
高山 信毅 神戸大学理学部教授	Mr. TAKAYAMA **Nobuki**, Professor, Faculty of Science, Kobe University *Funkcialaj Ekvacioj*
中西 康剛 神戸大学理学部教授	Mr. NAKANISHI **Yasutaka**, Professor, Faculty of Science, Kobe University *Kobe Journal of Mathematics*
島川 和久 岡山大学理学部教授	Mr. SHIMAKAWA **Kazuhisa**, Professor, Faculty of Science, Okayama University *Mathematics Journal of Okayama University*
吉野 正史 広島大学理学部教授	Ms. YOSHINO **Masafumi**, Professor, Faculty of Science, Hiroshima University *Hiroshima Mathematical Journal*
吉田 正章 九州大学数理学研究院教授	Ms. YOSHIDA **Masaaki**, Professor, MATHEMATICS Graduate Courses, Kyushu University *Kyushu Journal of Mathematics*
市来 陽子 社団法人日本数学会	Ms. ICHIKI **Yoko**, The Mathematical Society of Japan *Journal of the Mathematical Society of Japan*
阿部 義人 日本金属学会	Mr. Abe **Yoshito**, The Japan Institute Metals *MATERIALS TRANSACTION*
千葉 博紀 日本金属学会	Mr. CHIBA **Hiroki**, The Japan Institute Metals *MATERIALS TRANSACTION*
岩田 真一 紀伊國屋書店出版部	Mr. IWATA **Shinichi**, Kinokuniya Company

西川 青季 東北大学理学研究科教授	Mr. NISHIKAWA **Seiki**, Professor, Graduate School of Science, Tohoku University *Tohoku Mathematical Journal*
石田 正典 東北大学理学研究科教授	Mr. ISHIDA **Masanori**, Professor, Graduate School of Science, Tohoku University
高木 泉 東北大学理学研究科教授	Mr. TAKAGI **Izumi**, Professor, Graduate School of Science, Tohoku University
森田 康夫 東北大学理学研究科教授	Mr. MORITA **Yasuo**, Professor, Graduate School of Science, Tohoku University
竹田 雅好 東北大学理学研究科教授	Mr. TAKEDA **Masayoshi**, Professor, Graduate School of Science, Tohoku University
小田 忠雄 東北大学名誉教授	Mr. ODA **Tadao**, Professor Emeritus, Tohoku University
佐山 淳子 東北大学理学研究科技官	Ms. SAYAMA **Junko**, Secretary, Graduate School of Science, Tohoku University
浦川 肇 東北大学情報科学研究科教授	Ms. URAKAWA **Hajime**, Professor, Graduate School of Information Sciences, Tohoku University *Interdisciplinary Information Sciences*
坂上 光明 東北大学附属図書館事務部長	Mr. SAKAGAMI **Mitsuaki**, Library, Tohoku University
諏訪田 義美 東北大学附属図書館総務課長	Mr. SUWADA **Yoshimi**, Library, Tohoku University
佐藤 正弘 東北大学附属図書館情報管理課長	Mr. SATO **Masahiro**, Library, Tohoku University
白石 光雄 東北大学附属図書館情報サービス課長	Mr. SHIRAISHI **Mitsuo**, Library, Tohoku University
松井 好次 東北大学附属図書館情報サービス課図書館専門員	Mr. MATSUI **Koji**, Library, Tohoku University
米澤 誠 東北大学附属図書館情報企画掛長	Mr. YONEZAWA **Makoto**, Library, Tohoku University
照内 弘通 東北大学附属図書館情報企画掛	Mr. TERUUCHU **Hiromichi**, Library, Tohoku University
尾田 陽子 東北大学附属図書館北青葉山分館	Ms.ODA **Yoko** , Library, Tohoku University
及川 恵美子 東北大学金属材料研究所図書掛長	Ms. OIKAWA **Emiko** , Library, Tohoku University
小澤 史子 東北大学多元物質科学研究所図書室	Ms. OZAWA **Fumiko** , Library, Tohoku University
遠藤 みつ子 東北大学サイクロトロン IR センター図書室	Ms. ENDO **Mitsuko** , Library, Tohoku University

テレサ・イーリング コーネル大学図書館	**Mrs. Teresa EHLING**, Director of Electric Publishing, Cornell University Library
デイビッド・ラディ コーネル大学図書館	**Mr. David RUDDY**, Head of Systems Development and Production, Electric Publishing, Cornell University Library
安達 淳 国立情報学研究所（NII）教授	**Mr. ADACHI Jun**, Professor, Director, Research Center for Information Resources, NII
渡辺 恵子 国立情報学研究所（NII）助教授	**Mrs. WATANABE Keiko**, Associate Professor, Research Center for Information Resources, NII
大場 高志 国立情報学研究所（NII） 開発・事業部コンテンツ課長	**Mr. OBA Takashi**, Director, Contents Division, Development and Operations Department, NII
土屋 俊 千葉大学文学部教授	**Mr. TSUCHIYA Shun**, Professor, Faculty of Letters, Chiba University

6.3 「第51回幾何学シンポジウム」講演要旨（目次）

第51回幾何学シンポジウム講演要旨

於　東京都立大学

２００４年8月7日 ～ 10日

平成１６年度科学研究費補助金基盤研究
課題番号 14204002　代表　二木昭人 A(1)
課題番号 15204005　代表　前田吉昭 A(2)
課題番号 16204007　代表　宮岡礼子 A(1)
他
小磯憲史 A(2)，満渕俊樹 A(2)，西川青季 A(1)

2004年8月7日（土）

２００４年８月８日（日）

２００４年８月９日（月）

２００４年８月１０日（火）

基調講演
教養部教室棟１２０番教室

パラレルセッション
会場 A：教養部教室棟 １２０番教室
会場 B：教養部教室棟 １１０番教室
会場 C：教養部教室棟 １０６番教室
会場 D：教養部教室棟 １０５番教室

6.4 「Open Forum on Digital Publication and Digital Library」記録

Open Forum on Digital Publication and Digital Library

January 24, 2005

Venue: Conference Room (Room #501), 5th floor, Aoba Memorial Hall, Tohoku University

Monday January 24, 2005

14:00 Opening - Professor NISHIKAWA, Tohoku University
Welcome - NAKATSUKA, Trustee of Tohoku University

14:10 Digital Publishing System (DPubS) Software Project : Open source from Project Euclid -
Mr. David RUDDY, Head of Systems Development and Production, Electric Publishing, Cornell University

15:00 Q & A

15:15 Digital Mathematics Library and Retrodigitization Projects in US -
Professor Phillippe TONDEUR, University of Illinois at Urbana-Champaign, former director of the Division of Mathematical Science (DMS) of the National Science Foundation (NSF)

16:15 Q & A

16:30 Closing

デジタル出版とデジタル図書館に関する公開フォーラム

2005 年 1 月 24 日

会場：東北大学 青葉記念会館 5 階 大会議室（501）

2005 年 1 月 24 日（月）

14:00 開会 － 西川教授（東北大学）
挨拶 － 中塚理事（東北大学）

14:10 DPubs：Project Euclid で開発したオープンソースの電子出版システム －
デイビッド・ラディ氏（コーネル大学）

15:00 質疑応答

15:15 デジタル・マセマティック・ライブラリーと米国における遡及電子化プロジェクト －
フィリップ・トンデュール教授（イリノイ大学アーバナ・シャンペーン校，前 NSF 数学部門局長）

16:15 質疑応答

16:30 閉会

Open Forum on Digital Publication and Digital Library

January 24, 2005

List of Participants

Venue: Conference Room (Room #501), 5th floor, Aoba Memorial Hall, Tohoku University

出席者	Participants
大西 仁 東北大学理事，附属図書館長	**Professor. OHNISHI Hitoshi**, Trustee of Tohoku University
小野瀬 うた子 東北大学金属材料研究所	**Ms. ONOSE Utako**, Institute for Materials Research, Tohoku University
内藤 英雄 東北大学附属図書館事務部長	**Mr. NAITO Hideo**, Library, Tohoku University
諏訪田 義美 東北大学附属図書館総務課長	**Mr. SUWADA Yoshimi**, Library, Tohoku University
佐藤 正弘 東北大学附属図書館情報管理課長	**Mr. SATO Masahiro**, Library, Tohoku University
白石 光雄 東北大学附属図書館情報サービス課長	**Mr. SHIRAISHI Mitsuo**, Library, Tohoku University
高橋 信野 東北大学附属図書館総務課課長補佐	**Mr. TAKAHASHI Shinya**, Library, Tohoku University
米澤 誠 東北大学附属図書館情報企画係長	**Mr. YONEZAWA Makoto**, Library, Tohoku University
永井 伸 東北大学附属図書館情報企画係	**Mr. NAGAI Shin**, Library, Tohoku University
土田 奈穂子 東北大学附属図書館情報企画係	**Ms. TSUCHIDA Naoko**, Library, Tohoku University
半澤 智絵 東北大学附属図書館雑誌情報係	**Ms. HANZAWA Tomoe**, Library, Tohoku University
後藤 敏行 東北大学附属図書館閲覧第一係	**Mr. GOTO Toshiyuki**, Library, Tohoku University
佐藤 初美 東北大学附属図書館閲覧第二係長	**Ms. SATO Hatsumi**, Library, Tohoku University
渡邊 愛子 東北大学附属図書館農学分館	**Ms. WATANABE Aiko**, Agricultural Library, Tohoku University
関戸 麻衣 東北大学附属図書館農学分館	**Ms. SEKIDO Mai**, Agricultural Library, Tohoku University

6.5 「Workshop on Geometric Analysis」記録

Workshop on Geometric Analysis

日時: 2005年 2月 21日(月)～ 2月24日(木)
場所: 東北大学 理学研究科 数学棟 518号室

Miguel Abreu (Instituto Superior Tecnico) Mon. 10:40-11:40 & Mon. 2:30-3:30

"Toric Kahler metrics in symplectic coordinates"

Abstract: I will motivate and describe a parametrization for toric Kahler metrics on symplectic 2n-manifolds (and orbifolds) equipped with a Hamiltonian n-torus action, using symplectic coordinates and potentials (instead of the more common complex analogues). The relevant properties of this approach will be discussed and illustrated with several explicit examples.

I will then concentrate on the constant and extremal (in the sense of Calabi) scalar curvature equation, motivating its special form in this setting, describing explicit interesting solutions and discussing some of its analytical properties.

Almost all of what will be presented in these two talks is the result of separate work by Guillemin, Abreu and Donaldson.

Jingyi Chen (University of British Columbia) Mon. 4:00-5:00 & Tue. 10:40-11:40

"Some geometric PDEs arising from calibrations"

Abstract: In the first talk, I will discuss mean curvature flows for 2-dimensional symplectic surface in a Kaehler-Eistein surface and Lagangian submanifolds in a Calabi-Yau n-fold. In the second talk, I will discuss maps between hyperkaehler manifolds, which satisfy a first order system and are related to harmonic maps and minimal surfaces.

Richard Schoen (Stanford University) Tue. 2:30-3:30 & Tue. 4:00-5:00

"Minimal Submanifolds I: Lagrangian volume minimization and special lagrangian submanifolds"

Abstract: In high codimension there are special classes of volume minimizing submanifolds which one would like to construct in general situations. These include special lagrangian submanifolds. In this talk we will describe this class of submanifolds and survey the progress on existence questions via variational methods, mean curvature flow, and gluing methods. We will discuss some of the many open problems in this area.

"Minimal Submanifolds II: On the isoperimetric inequality for minimal surfaces"

Abstract: A longstanding conjecture concerning the geometry of minimal surfaces is that the sharp isoperimetric inequality (relating the area of the surface and its boundary length) should hold in general. In this talk we will survey this problem and present some new methods of attack which solve the problem in general situations. The methods involve a careful analysis of flat cone metrics which are related in a natural way to the minimal surface.

Peter Topping (University of Warwick) Wed. 10:40-11:40 & Wed. 2:30-3:30

" Ricci flow I: A selected survey."

Abstract: I'll describe what the Ricci flow is, and some of the basic theory, including a few ideas of Perelman which are interesting from a geometric analysis point of view. (Aimed at a general audience who know a bit of Riemannian geometry.)

"Ricci flow II: Singular initial configurations."

Abstract: I'll show how one of the ideas from the 1st talk can be used to prove a compactness theorem for Ricci flows, which gives us some unconventional existence theorems.

Seiki Nishikawa (Tohoku University) Wed. 4:00-5:00

"Harmonic maps into complex Finsler manifolds"

Jiaping Wang (University of Minnesota) Thurs. 10:40-11:40 & Thurs. 2:30-3:30

"Function theory and its applications"

Abstract: Function theory has been successfully applied to derive various geometric and topological information of Riemannian manifolds. In the two talks, I plan to explain some of these aspects and mention a few open problems.

Futoshi Takahashi (Tohoku University) Thurs. 4:00-5:00

"On an isoperimetric inequality for mapping with remainder term"

6.6 「第52回幾何学シンポジウム」講演要旨（目次）

第52回　幾何学シンポジウム　講演要旨

2005年8月20日 (土) - 8月23日 (火)

福岡大学

平成１７年度科学研究費補助金

代表　小磯憲史　基盤A

代表　山口孝男　基盤A

他　西川青季，金井雅彦，前田吉昭（各基盤A）

2005年度幾何学シンポジウム プログラム

8月20日(土)

8月21日(日)

8月22日(月)

8月23日(火)

The 52nd Geometry Symposium Program

August 20, (Sat.)

August 21, (Sun)

August 22, (Mon.)

August 23, (Tues.)

6.7 「部分多様体論・湯沢2005」記録

部分多様体論・湯沢 2005

■ 日程： 2005年11月23日(水・祝)～25日(金)

■ 場所： 新潟県湯沢町・湯沢グランドホテル（合宿形式）
TEL： 025-784-2351 （ＦＡＸ）025-784-4520
URL： http://www.ygh-jp.com/

■ プログラム

○ 11月23日（水・祝）
- 14：30—15：30 坊向伸隆氏（大阪市立大学）
「シンプレクティック等質空間と非コンパクト単純リー群」
- 15：45—16：45 小池直之氏（東京理科大学）
「複素等焦部分多様体と Hermann 型作用」
- 17：00—18：00 濱田龍義氏(福岡大学)
「対話式幾何学ソフトウェアについて」
- 20：00—21：00 ショートコミュニケーション
杉山儀 氏（名古屋工業大学）
野田知宣氏（大阪市立大学）

○ 11月24日（水）
- 8：50— 9：50 昆万佑子氏（北海道大学）
「Ricci-recurrent な実超曲面について」
- 10：10—11：10 大仁田義裕氏（大阪市立大学）
「The deformation and stability of special Lagrangian cones」
- 11：20—12：20 岡安隆氏（茨城大学）
「スカラー曲率一定な完備超曲面の構成」
- 15：00—16：00 剱持勝衛氏（東北大学）
「平均曲率一定回転超曲面に関する Hsiang-Yu の定理の別証明」
- 16：30—17：30 國分正敏氏（東京電機大学）
「３次元双曲型空間のある種の Weingarten 曲面について」
- 20：00—21：00 ショートコミュニケーション
田崎 博之氏（筑波大学）
小野 肇氏（首都大学東京）

○ 11月25日（金）
- 8：50— 9：50 酒井高司氏（首都大学東京）
「Transferred kinematic formulae in two point homogeneous spaces」
- 10：10—11：10 兼田英二氏（大阪外国語大学）
「Symplectic 群 Sp(n)の正準等長埋め込みの剛性について」
- 11：20—12：20 東條晃次氏（千葉工業大学）
「アファイン対称空間とコンパクト 3-対称空間の複素構造及び全実全測地的部分多様体」

参加者

井川 治	福島工業高等専門学校
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宇田川 誠一	日本大学
榎本 一之	東京理科大学
大仁田 義裕	大阪市立大学
小野 肇	首都大学東京
岡安 隆	茨城大学
金行 壮二	日本工業大学
兼田 英二	大阪外国語大学
釼持 勝衛	東北大学
小池 直之	東京理科大学
國分 雅敏	東京電機大学
昆 万佑子	北海道大学
酒井 高司	首都大学東京
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野田 知宣	大阪市立大学
濱田 龍義	福岡大学
藤岡 敦	一橋大学
古畑 仁	北海道大学
坊向 伸隆	大阪市立大学
田崎 博之	筑波大学
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田丸千夏	
塚本千秋	京都工芸繊維大学
東條 晃次	千葉工業大学
平川信也	東北大学
間下 克哉	東京農工大学
守屋 克洋	筑波大学

28名

部分多様体論・湯沢２００５

研究集会記録

2005 年 11 月 23 日（水）～25 日（金）
於　新潟県 湯沢町・湯沢グランドホテル

世話人：　東北大学　　剱持勝衛
　　東京農工大学　間下克哉
　　筑波大学　　田崎博之

平成 17 年度文部省科学研究費補助金 基盤研究(A)
未踏数学の開拓と情報発信の高度化（15204003）
研究代表者：　東北大学・大学院理学研究科・教授　西川 青季

平成 17 年度　文部省科学研究費補助金 基盤研究(C)
ケイリー代数とグラスマン幾何学（16540055）
研究代表者：　東京農工大学・教授　間下 克哉

序文

研究集会「部分多様体論・湯沢 2005」は、2005 年 11 月 23 日（水）から 25 日（金）までの３日間にわたり湯沢グランドホテル（新潟県・湯沢町）において、合宿形式で行われました．剱持勝衛先生により 1996 年 11 月に第１回が開かれて以来，同じ時期に同じ場所で同じ規模で継続して行っている研究集会「部分多様体論・湯沢」の第 10 回にあたるものです．

今回も２８名の参加があり大きな成果をあげることができました．ショートコミュニケーションを含む１５名の講演者の皆様には周到な準備のもとに興味深い講演をしていただき，さらにこの記録集の原稿の作成もしていただきました．東北大学・西川青季教授には，代表となっている科学研究費から援助をいただきました．また湯沢グランドホテルには快適な会場の設営にご協力いただきました．これらの皆様をはじめとして，有意義な研究会となるようご協力いただいた全ての参加者の皆様に感謝の意を表します．

世話人を代表して

間下　克哉

目　　次

6.8 「Differential Geometry, Sendai 2006」記録

研究集会「Differential Geometry, Sendai 2006」

東北大学西川青季氏の科学研究費（基盤A（1）（一般））の補助により，研究集会「Differential Geometry, Sendai 2006」を下記のように開催致します．ご参加頂ければ幸いです．

日時：２００６年２月９日(木)

場所：東北大学工学部「青葉記念会館」中研修室（７０２号室）

プログラム

10:00–10:50 Mihai Adela (Universitatea din Bucuresti),
Geometric inequalities for submanifolds in complex space forms

11:00–11:50 Fujioka Atsushi (Hitotsubashi University),
Curves and surfaces related to conformal differential geometry

13:30–14:20 Loubeau Eric (Universite de Brest),
Biharmonic maps

14:30–15:20 Katagiri Minyo (Nara Women's University),
Critical Riemannian metrics for a curvature functional

15:30–16:20 Nishikawa Seiki (Tohoku University),
Critical metrics of the Schouten functional on four-manifolds

旅費のサポートができます．希望される方は世話人宛に２００６年１月２０日(金)までにメールでご連絡ください．

会場へのアクセス：ＪＲ仙台駅西口バスプール９番乗り場より市バス，「宮教大」，「宮教大・青葉台」，「宮教大・成田山」，「動物公園循環（青葉通・理・工学部・仙台城跡南経由）」乗車で，「工学部中央」下車徒歩１分．

青葉記念会館については下記 URL をご参照ください.
http://www.eng.tohoku.ac.jp/php/eng/campusmap/building/map-f-6.php

世話人
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Workshop
「Differential Geometry, Sendai 2006」

Date : 09 February 2006

Place : Aoba Memorial Hall, Room 702
(School of Engineering, Tohoku University)

Program

10:00–10:50 Mihai Adela (Universitatea din Bucuresti),
Geometric inequalities for submanifolds
in complex space forms

11:00–11:50 Fujioka Atsushi (Hitotsubashi University),
Curves and surfaces related to conformal
differential geometry

13:30–14:20 Loubeau Eric (Universite de Brest),
Biharmonic maps

14:30–15:20 Katagiri Minyo (Nara Women's University),
Critical Riemannian metrics for a curvature
functional

15:30–16:20 Nishikawa Seiki (Tohoku University),
Critical metrics of the Schouten functional
on four-manifolds

参加者リスト

Fujioka Atsushi	藤岡 敦	一橋大学
Hasegawa Izumi	長谷川和泉	北海道教育大学
Hirakawa Shinya	平川信也	東北大学理学部
Ichiyama Toshiyuki	一山稔之	亜細亜大学
Inoguchi Jyun-ichi	井ノ口順一	宇都宮大学
Izeki Hiroyasu	井関裕靖	東北大学理学部
Kamada Hiroyuki	鎌田博行	宮城教育大学
Katagiri Minyo	片桐民陽	奈良女子大学
Kato Masao	加藤正夫	東北大学情報
Kikuta Shin	菊田 伸	東北大学理学部
Loubeau Eric	Loubeau Eric	Universite de Brest
Matsumoto Koji	松本紘司	山形大学
Mihai Adela	Mihai Adela	Universitatea din Bucuresti
Nagata Osamu	長田 治	富山大学理学部
Nishikawa Seiki	西川青季	東北大学理学部
Sato Mitsuhiro	佐藤光広	東北大学情報
Sato Tetsu	佐藤 哲	国際電気通信基礎技術研究所
Ueno Keisuke	上野慶介	山形大学理学部
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Yawata Makoto	八幡 誠	千葉工大

２０名

6.9 「部分多様体論・湯沢 2006」記録

部分多様体論・湯沢 2006

■ 日程： 2006 年 11 月 29 日(水)～12 月 1 日(金)

■ 場所： 新潟県湯沢町・湯沢グランドホテル（合宿形式）
TEL： 025-784-2351 （ＦＡＸ）025-784-4520
URL： http://www.ygh-jp.com/

■ プログラム

○ 11 月 29 日（水）
- 14:30～15:30 木村太郎（東京理科大）
  階数２のコンパクト対称空間内の全測地的部分多様体について
- 15:45～16:45 梅原雅顕（大阪大）
  R^3 の平坦な波面について
- 17:00～18:00 安藤直也（熊本大）
  曲面の曲率線の測地的曲率について
- 20:00～21:00 ショートコミュニケーション
  間下克哉（東京農工大）
  北川友美子（東京理科大）

○ 11 月 30 日（目）
- 8:40～9:40 坊向伸隆（大阪市大）
  アフィン対称空間内の鏡映部分多様体
- 10:00～11:00 大仁田義裕（大阪市大）
  可積分系による Willmore 予想へのアプローチ（概説）I
- 11:20～12:20 岡安隆（茨城大）
  スカラー曲率０な超曲面の構成
- 14:30～15:30 大仁田義裕（大阪市大）
  可積分系による Willmore 予想へのアプローチ（概説）II
- 15:45～16:45 守屋克洋（筑波大）
  Lagrangian surfaces in terms of quaternions
- 17:00～18:00 野田知宣（大阪市大）
  対称性をもつ presymplectic 多様体の幾何
- 20:00～21:00 ショートコミュニケーション
  昆万佑子（北海道大）
  田中亜矢子（横浜市立大）

○ 11 月 25 日（金）
- 8:40～9:40 入江博（電機大）
  ハミルトン微分同相群およびその等質空間上の Hofer 幾何について
- 10:00～11:00 酒井高司（大阪市大）
  弱鏡映部分多様体と austere 部分多様体
- 11:20～12:20 ラスマン（神戸大）
  H^3 の平坦な波面について

参加者

安藤 直也	熊本大学
入江 博	東京電機大学
ウェイン ラスマン	神戸大学
梅原 雅顕	大阪大学
大仁田 義裕	大阪府立大学
岡安 隆	茨城大学
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剱持 勝衛	
後藤 清香	東京理科大学理工学部
古田 高士	富山大学
小林 真平	東京電機大学情報環境学部
昆 万佑子	北海道大学
酒井 高司	大阪府立大学
坂根 由昌	大阪大学
田崎 博之	筑波大学
田中 亜矢子	横浜市立大学
野田 知宣	大阪府立大学
藤岡 敦	一ツ橋大学
坊向 伸隆	大阪府立大学
間下 克哉	東京農工大学
守屋 克洋	筑波大学

23 名

部分多様体論・湯沢２００６

研究集会記録

2006年 11月 29日（水）～12月1日（金）
於　新潟県 湯沢町・湯沢グランドホテル

世話人：　東京農工大学　間下克哉
筑波大学　　田崎博之

平成18年度文部省科学研究費補助金 基盤研究(A)
未踏数学の開拓と情報発信の高度化（15204003）
研究代表者：　東北大学・大学院理学研究科・教授　西川 青季

平成18年度　文部省科学研究費補助金 基盤研究(C)
ケイリー代数とグラスマン幾何学（16540055）
研究代表者：　東京農工大学・教授　間下 克哉

序文

研究集会「部分多様体論・湯沢 2006」は、2006 年 11 月 29 日（水）から 12 月１日（金）までの３日間にわたり湯沢グランドホテル（新潟県・湯沢町）において、合宿形式で行われました．剱持勝衛先生により 1996 年 11 月に第１回が開かれて以来，同じ時期に同じ場所で同じ規模で継続して行っている研究集会「部分多様体論・湯沢」の第 11 回にあたるものです．

今回も２３名の参加があり大きな成果をあげることができました．ショートコミュニケーションを含む１５名の講演者の皆様には周到な準備のもとに興味深い講演をしていただき，さらにこの記録集の原稿の作成もしていただきました．東北大学・西川青季教授には，代表となっている科学研究費から援助をいただきました．また湯沢グランドホテルには快適な会場の設営にご協力いただきました．これらの皆様をはじめとして，有意義な研究会となるようご協力いただいた全ての参加者の皆様に感謝の意を表します．

世話人を代表して

間下　克哉

目　　次

6.10 「Geometric Analysis, Sendai 2007」記録

WORKSHOP
"Geometric Analysis, Sendai 2007"
January 13 – 15, 2007

Venue : Sendai International Center, Meeting Room 2 (Jan. 13 and 14)
Mathematical Institute, Tohoku University, Room 518 (Jan. 15)

PROGRAM

January 13 (Sat.)

9:30–10:00 Registration and Opening

10:00–11:00 Seiki Nishikawa (Tohoku University)
Asymptotic expansion of the Chern-Simons integral
– One-loop approximation via stochastic analysis

11:15–12:15 Paul Baird (University of Brest)
Three-dimensional Ricci solitons

14:00–15:00 Zejun Hu (Zhengzhou University)
Riemannian functionals and their critical metrics

15:15–16:15 Thomas Au (Chinese University of Hong Kong)
Comparing corresponding dihedral angles
on classical geometric simpleces

16:30–17:30 Huili Liu (Northeastern University)
Curves and hypersurfaces in lightlike cones

January 14 (Sun.)

10:00–11:00 Udo Simon (Technical University of Berlin)
Schouten curvature functions on conformally flat manifolds

11:15–12:15 Tadashi Aikou (Kagoshima University)
Complex Finsler metrics and Chern-Finsler connection

14:00–15:00 Martin Guest (Tokyo Metropolitan University)
Three remarks on singularities of harmonic maps

15:15–16:15 Xiaohuan Mo (Peking University)
Harmonic morphisms and Randers metrics of constant flag curvature

16:30–17:30 Hironori Kumura (Shizuoka University)
Radial curvature of ends and spectral structure of the Laplacian

January 15 (Mon.)

10:00–11:00 Ali Fardoun (University of Brest)
Weakly p-harmonic maps to a closed hemisphere

11:15–12:15 Rachid Regbaoui (University of Brest)
Nodal sets of solutions to non-local equations in compact Riemannian manifolds

13:30–14:30 Yuguang Shi (Peking University)
Rigidity of compact manifolds and positivity of quasilocal mass

14:45–15:45 Sumio Yamada (Tohoku University)
A finite rank property of Teichmüller spaces

Organizers:

Seiki Nishikawa (Tohoku University)
Keisuke Ueno (Yamagata University)

January 15 (Mon.)

LIST of PARTICIPANTS

WORKSHOP

"Geometric Analysis, Sendai 2007"

January 13 - 15, 2007

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Geometric Analysis, Sendai 2007

January 13 - 15, 2007

ABSTRACTS

Sendai International Center, Meeting Room 2 (Jan. 13 and 14)
Mathematical Institute, Tohoku University, Room 518 (Jan. 15)
Sendai, Japan

CONTENTS

7 研究成果発表

7.1 Advanced Studies in Pure Mathematics, Vol. 35 表紙, 序文, 目次

ADVANCED STUDIES
IN PURE MATHEMATICS 35

Chief Editor: Eiichi Bannai (Kyushu University)

Higher Dimensional Birational Geometry

Edited by
Shigefumi Mori (Kyoto University) and
Yoichi Miyaoka (University of Tokyo)

Mathematical Society of Japan

This book was typeset by $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-TEX and $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-LATEX, the TEX macro systems of the American Mathematical Society, together with the style files `aspm.sty` *and* `aspmfm.sty` *for $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-TEX written by Dr. Chiaki Tsukamoto and* `aspmproc.sty` *for $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-LATEX written by Dr. Akihiro Munemasa.*

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Advanced Studies in Pure Mathematics 35

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Preface

The present volume consists of four research articles contributed by participants of the international conference *Higher Dimensional Algebraic Varieties*, 1997, at the Research Institute of Mathematical Sciences (RIMS), Kyoto University during June 2–6 and 9–13, 1997.

The conference, held as part of the special year activities of RIMS during the academic year 1996/97 and cosponcored by the Mathematical Society of Japan, represented the high level of the birational geometry at the time. The invited speakers and their talks were:

Y. Miyaoka (U. Tokyo), On a numerical characterization of $\mathbf{P}^n$.
N. Nakayama (RIMS), Projective manifolds whose universal covering spaces are $\mathbf{C}^n$.
A. Corti (U. Cambridge), Birationally rigid $\mathbf{Q}$-Fano hypersurfaces I (Excluding maximal singularities).
M. Reid (Warwick U.), Birationally rigid $\mathbf{Q}$-Fano hypersurfaces II (Constructing birational involutions and untwisting).
J. Kollár (Princeton U.), Polynomials with integral coefficients.
F. Bogomolov (Courant Inst.), Weak Hironaka theorem.
Y. Kawamata (U. of Tokyo), Unobstructed deformations and index 1 covers.
S. Keel (1) (U. Texas, Austin), Eventual freeness in char p, with applications to M_g and to 3-fold MMP.
L. Ein (U. Illinois at Chicago), Singularities of theta divisors and birational geometry of irregular varieties.
S. Helmke (RIMS), On global generation of adjoint linear systems.
K. Matsuki (Purdue U.), Surface log terminal singularities in positive characteristic.
S. Mukai (RIMS), Degeneration of $\mathbf{P}^n \times \mathbf{P}^n$ with application to del Pezzo fibration.
V. Alexeev (U. Georgia), Log canonical singularities and complete moduli.
G. Sankaran (U. Bath), Abelian surfaces in toric 4-folds.
S. Keel (2) (U. Texas, Austin), Rational curves on open surfaces I.
J. McKernan (U. C. Santa Barbara), Rational curves on open surfaces II.
S. Mori (RIMS), On Reid's conjecture on general elephants.
M. Hanamura (Kyushu U.), Mixed motivic sheaves

In the second week, more informal talks were given:

A. Corti, Introduction to the Sarkisov program.
J. Kollar, Real algebraic threefolds.
S. Keel and J. McKernan, Rational curves on open surfaces.
V. V. Shokurov (Johns Hopkins U.), Log flips.

We believe that it would have been a great volume if we could have collected the lectures delivered at the conference. However, some of them had already been submitted elsewhere and some were a little too technical to be included in the ASPM series, which is supposed to be of expository nature. By these twofold reasons, the editors decided that this volume shouild not be the ordinary proceedings of the conference but a selection of independent full expositions on different topics of fundamental importance in algebraic geometry: moduli spaces of abelian surfaces, rational curves on algebraic vareities, 3-dimensional flips and the theory of elliptic fibrations.

The authors made their best to update the articles to fill the time lag between the conference and the publication, and the editors hope that this volume will provide accessible and systematic treatments of several aspects of recent exciting developments in algebraic geometry.

The editors express their gratitude to the contributors who have patiently awaited the belated publication, and apologise to the Editorial Board of the ASPM for the delay of the preparation and the unusual style of this volume.

Shigefumi Mori
Yoichi Miyaoka

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

CONTENTS

7.2 Advanced Studies in Pure Mathematics, Vol. 36 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 36

Chief Editor: Eiichi Bannai (Kyushu University)

Algebraic Geometry 2000, Azumino

Edited by

Sampei Usui (Osaka University) (Chief)
Mark Green (UCLA)
Luc Illusie (Université de Paris-Sud)
Kazuya Kato (Kyoto University)
Eduard Looijenga (University of Utrecht)
Shigeru Mukai (RIMS, Kyoto University) and
Shuji Saito (Nagoya University)

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Preface

五年かけみんなの夢が咲いた本

The symposium "Algebraic Geometry 2000, Azumino" was held at Izumigo Plaza Hotel Azumino in Hotaka (Nagano, Japan) from July 20 until July 30, 2000.

There were 148 participants, including 59 from overseas and a lot of young researchers, who came from 17 countries: Australia, France, Germany, Greece, India, Israel, Italy, Japan, Korea, the Netherlands, Poland, Romania, Russia, Taiwan, Tunisia, the United Kingdom and the United States.

The topic of the symposium was: Interactions of Algebraic Geometry, Hodge Theory and Logarithmic Geometry from the view point of Degenerations. During the period of the symposium, related 38 invited lectures were presented, and there were various kind of stimulating discussions among leading experts and young researchers.

Our goals were, on one side, the interactions among the schools of Algebraic Geometry, of Hodge Theory and of Logarithmic Geometry from the view point of degenerations, and, on the other side, the interactions among leading experts and young researchers. Thanks to the active cooperations of all participants, we are quite confident that both goals were successfully achieved, we even hope that this symposium will continue to have a positive impact on the future relations among various schools of thoughts about the study and the use of degenerations. The meeting was also successful from the view point of its organization. The beautiful location at Izumigo Plaza Hotel Azumino, in the Japan Alps, provided such a stimulating atmosphere.

The present volume is the Proceedings of the symposium, and it contains 12 articles by some of the participants. All papers in this volume were rigorously refereed.

On behalf of the organizers, we wish to express our hearty thanks to all invited speakers for their interesting talks, and to all participants for their stimulating discussions and the warm response to the symposium.

On behalf of the editors, we wish to express our appreciations to the authors for their efforts in preparing their manuscripts. We are deeply grateful to all our referees for their immense efforts and discipline in evaluating the papers.

This symposium was supported by Grants-in-Aid for Scientific Researches, Ministry of Education, Science, Sports and Culture, Japan. We are grateful for their generous finantial support.

July, 2002
The Editors:
Sampei Usui (Chief)
Mark Green
Luc Illusie
Kazuya Kato
Eduard Looijenga
Shigeru Mukai
Shuji Saito

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

Algebraic Geometry 2000, Azumino

Period: July 20–30, 2000
Place: Izumigo Plaza Hotel Azumino, Nagano, Japan

Program:

July 20 (Thursday)

09:40 – 10:40 **Phillip Griffiths** (Talk was given by M. Green)
Tangent spaces to the space of Algebraic cycles

11:00 – 12:00 **Mark Green**
Periods of Abel-Jacobi maps and spread

15:00 – 16:00 **Masanori Asakura**
On the K_1-groups of algebraic curves

16:20 – 17:20 **Morihiko Saito**
On a refined cycle map

July 21 (Friday)

09:40 – 10:40 **Kazuya Kato**
Moduli of logarithmic Hodge structures and period maps I
(Generalizations of theories of Mumford, Borel-Serre, Griffiths)

11:00 – 12:00 **Sampei Usui**
Moduli of logarithmic Hodge structures and period maps II
(Generalizations of theories of Mumford, Borel-Serre, Griffiths)

15:00 – 16:00 **Shuji Saito**
Periods of integral of degenerating hypersurfaces and logarithmic Torelli problem

16:20 – 17:20 **Bert van Geemen**
Half-twists of Hodge structures of CM-type

17:40 – 18:40 **Steven Zucker**
The reductive Borel-Serre as an algebraic variety

July 22 (Saturday)

09:40 – 10:40 **Hélène Esnault**
Riemann-Roch problems for linear differential equations I

11:00 – 12:00 **Spencer Bloch**
Riemann-Roch problems for linear differential equations II

15:00 – 16:00 **Claire Voisin**
Nori connectivity theorem and regulator maps

16:20 – 17:20 **Stefan Müller-Stach**
On K_2 of an algebraic surface

17:40 – 18:40 **Joseph Steenbrink**
Remarks about the cohomology of discriminant complements

July 24 (Monday)

09:40 – 10:40 **Kazuhiro Konno**
A note on canonical algebras on surfaces

11:00 – 12:00 **Nick Shepherd-Barron**
Isomorphism classes in local moduli spaces

15:00 – 16:00 **Tadashi Ashikaga**
Remarks on degenerations of curves

16:20 – 17:20 **Koji Ohno**
On degenerations of algebraic surfaces with Kodaira dimension zero without semi-stable assumption

July 25 (Tuesday)

09:40 – 10:40 **Shigeru Mukai**
Elementary moduli construction without quotient scheme

11:00 – 12:00 **Eyal Markman**
Hyperkahler varieties; their reflections and monodromy

15:00 – 16:00 **Ken-ichi Yoshikawa**
K3 surfaces with involution, Analytic torsion and Automorphic Forms on the Moduli Space

16:20 – 17:20 **Shigeyuki Kondo**
A ball quotient structure for the moduli of curves of genus 3 and 4

July 26 (Wednesday)

09:40 – 10:40 **Eduard Looijenga**
A complete moduli space for rational elliptic fibrations

11:00 – 12:00 **Masanori Ishida**
Intersection complexes of toric varieties

15:00 – 16:00 **Valery Alexeev**
Moduli of stable maps with group action

16:20 – 17:20 **Yoshinori Namikawa**
Complex symplectic varieties

July 28 (Friday)

09:40 – 10:40 **Arthur Ogus**
The Poincaré lemma and its variations

11:00 – 12:00 **Mark Kisin**
Endomorphisms of Logarithmic Schemes

15:00 – 16:00 **Wieslawa Niziol**
K-theory of log schemes

16:20 – 17:20 **Chikara Nakayama**
Ket sites, roundings and log C^{∞}-functions

July 29 (Saturday)

09:40 – 10:40 **Luc Illusie**
On the local variation
11:00 – 12:00 **Takeshi Saito**
Conductor formula of Bloch
15:00 – 16:00 **Ofer Gabber**
Independence of l for intersection cohomology
16:20 – 17:20 **Kazuhiro Fujiwara**
Integral cohomology of unitary Shimura varieties

July 30 (Sunday)
09:40 – 10:40 **Shinichi Mochizuki**
The Hodge-Arakelov Theory of Elliptic Curves
11:00 – 12:00 **Christophe Breuil**
p-torsion Hodge theory: A survey
15:00 – 16:00 **Takeshi Tsuji**
Almost étale extensions and p-adic vanishing cycles
16:20 – 17:20 **Michel Raynaud**
The fundamental group of complete curves in characteristic p

Acknowledgement. On behalf of the organizers, we wish to express our hearty gratitude to the following people for their many supports without which this symposium could not be performed so smoothly: Masanori Asakura, Tadashi Ashikaga, Kenichi Bannai, Spencer Bloch, Kazuhiro Fujiwara, Takako, Fukaya, Kei Hagihara, Tetsuo, Hasegawa, Atsushi Ikeda, Teruhiko Inaoka, Tetsushi Ito, Noriko Kawashima, Masanori Kobayashi, Satoshi Kondo, Shigeyuki Kondo, Kazuhiro Konno, Toshiharu Matsubara, Satoshi Mochizuki, Masayoshi Nagata, Tadashi Ochiai, Tadao Oda, Akira Ohbuchi, Koji Ohno, Noriyuki Ohtsubo, Kayo Ohtsuka, Kusuhiro Ono, Michel Raynaud, Hiroshi Saito, Takeshi Saito, Kei Sasao, Ikuo Satake, Kanetomo Sato, Jun Shiho, Yuji Shimizu, Tohkyu Sugioka, Ohmi Sugiyama, Takeshi Usa, Chieko Usui, Noriaki Usui, Kaoru Yamano, Daisuke Yanase, Seidai Yasuda, Hatsue Yoshida, Teruyoshi Yoshida

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Survey Articles

Resarch Articles

7.3 Advanced Studies in Pure Mathematics, Vol. 37 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 37

Chief Editor: Eiichi Bannai (Kyushu University)

Lie Groups, Geometric Structures and Differential Equations — One Hundred Years after Sophus Lie —

Edited by

Tohru Morimoto (Nara Women's University)
Hajime Sato (Nagoya University) and
Keizo Yamaguchi (Hokkaido University)

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Preface

The present issue of Advanced Studies in Pure Mathematics is an outgrowth of the international conference entitled "Lie Groups, Geometric Structures, and Differential Equations - One Hundred Years after Sophus Lie - " , which took place, on the occasion of the centennial after the death of Sophus Lie (1842 - 1899), in Kyoto and Nara in December 1999. A rapid version of the proceedings has already appeared as one volume in Lecture Note Series of RIMS Kyoto University (RIMS Kokyuroku 1150, April 2000).

The influence of Sophus Lie on our mathematics today is so immense and so deep that it is almost out of our scope to overview all the aspects developed after Lie. But we wished that the conference would give us an opportunity to contemplate and discuss what Lie pursued, what developments had been achieved after Lie and what would be important for the coming new century, with the emphasis on the links between Lie groups, geometry and differential equations.

In this volume seventeen papers are presented, which reflect the contents, atmosphere and outgrowth of the above conference. Most of the papers are research papers of usual style, whose topics are rather diversified, but in a broader sense related to the developments of Lie's ideas. Subjects treated in this volume include Lie groups, geometry of differential equations, contact transformations, Bäcklund transformations, differential algebras, Cartan geometry, CR-geometry and some topics in differential geometry as well as topics in Mathematical Physics. Each contributed paper standing independently by itself, we will not give here comments on each paper, but mention briefly two survey papers specially prepared for this volume.

The paper, by Morimoto, develops a synthetic study of Lie groups, geometric structures and differential equations from a unified view point of nilpotent geometry, by studying objects on filtered manifolds through their first order approximations, nilpotent graded Lie algebras. Generalization from the abelian to the nilpotent proves to be algebraically natural, geometrically useful, and analytically revealing new phenomena. This survey will give an overview on links between groups, geometric structures and differential equations by trying to make clear the underlying structures common to them three.

The paper, by Yamaguchi and Yatsui, discusses the geometry of higher order differential equations of finite type. Starting from a reductive graded Lie algebra of the first kind and its faithful irreducible

representation, they specify a nice class of differential equations of finite type to which one can associate Cartan connections. Invariants of these Cartan connections being found in the generalized Spencer cohomology groups, they carry out detailed calculus of these cohomology groups. Thus there will be presented concrete models in which Lie groups, geometric structures and differential equations are beautifully woven.

The year when Lie passed away was also marked as the opening of a new epoch 1900 - 1910 in which Élie Cartan achieved his deep works on Pfaffian systems, infinite continuous groups, and differential equations, to make a great progress on what Lie had pursued. The underlying philosophy of the two surveys may be said to stem from this period.

We would like to express our sincere gratitude to all those who have helped us to organize the above-mentioned conference and to prepare and publish this volume.

"Don't follow in the wake of a sage of old,
but try to embark on the quest he pursued."
(Matsuo Basho, Translated by Shigeharu Ando)

Tohru Morimoto, Hajime Sato, Keizo Yamaguchi

Editors

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

CONTENTS

7.4 Advanced Studies in Pure Mathematics, Vol. 38 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 38

Chief Editor: Eiichi Bannai (Kyushu University)

Operator Algebras and Applications

Edited by

Hideki Kosaki (Kyushu University)

Mathematical Society of Japan

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Preface

There were several US-Japan Seminars on operator algebras in the past, many of which were held at important turning points in the development of the theory of operator algebras such as A. Connes' breakthrough on classification of injective factors, the advent of the Jones index theory and so on. The previous one was held at Philadelphia in 1988, and no seminar was held in the next ten years. However, during this period we witnessed far-reaching advancement of the classification theory on C^*-algebras based on the K-theory, and operator algebraists in the both sides of the Pacific felt to have to have another one with the main emphasis on this subject. Under these circumstances, with the generous financial support from the US National Science Foundation and the Japan Society for Promotion of Science, the US-Japan Seminar "Operator Algebras and Applications" was held on June 7-11, 1999 at the Kyushu University. It is my great pleasure to present here the proceedings of the seminar. At first I am grateful to Professor Bruce Blackadar for his leadership in the US side, which made it possible to plan such a seminar. I am also grateful to all the contributors for their willingness to give me original manuscripts for the current proceedings. Another thing worth recording here is the participation of Korean operator algebraists, which became possible by the mutual agreement between the Korea Science and Engineering Foundation and the above funding organizations. I am grateful to Professor Seung-Hyeok Kye for his effort to make this do happen, and am glad that three articles by Korean authors are included in the proceedings.

Fukuoka, June 2003 *Hideki Kosaki*

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

CONTENTS

7.5 Advanced Studies in Pure Mathematics, Vol. 39 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 39

Chief Editor: Eiichi Bannai (Kyushu University)

Stochastic Analysis on Large Scale Interacting Systems

Edited by

Tadahisa Funaki (University of Tokyo)
Hirofumi Osada (Nagoya University)

Mathematical Society of Japan

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Preface

Large scale interacting systems are various kinds of dynamic models, which usually involve random structures in their evolutional law, and arise in connection with statistical physics or quantum mechanics and also in other broad area of sciences. They are important objects of study in probability theory. This volume is a collection of fifteen research and survey papers concerning these subjects written by speakers of the two international conferences:

1. The Eleventh Mathematical Society of Japan International Research Institute (MSJ-IRI) "Stochastic Analysis on Large Scale Interacting Systems" which was held at the Shonan Village Center, Hayama, Kanagawa Prefecture, Japan from July 17th to 26th, 2002, and
2. "Stochastic Analysis and Statistical Mechanics" which was held at the Yukawa Institute for Theoretical Physics, Kyoto University on July 29th and 30th, 2002 in the framework of the Special Year for Probability Theory: 2002 International Project Research "Stochastic Analysis and Related Topics" run by Research Institute for Mathematical Sciences (RIMS), Kyoto University.

The MSJ-IRI meeting was divided into two parts, workshop and conference. The first part, July 17th-19th, was called workshop and consisted of four expository lecture series delivered by E. Bolthausen of Universität Zürich, S. Kotani of Osaka University, G. Papanicolaou of Stanford University, and S.R.S. Varadhan of New York University. The second part of the meeting, July 22nd-26th, was called conference and consisted of twenty one-hour invited research lectures and thirteen short contributed talks. The meeting in Kyoto was organized consecutively after the MSJ-IRI meeting and consisted of nine one-hour invited lectures. The chairmen of the organizing committees for these two conferences were T. Funaki of the University of Tokyo and H. Osada of Nagoya University, respectively, and serve as editors of the present volume.

The topics which are discussed in this volume cover the hydrodynamic limit, fluctuations, large deviations, spectral gap (Poincaré inequality), logarithmic Sobolev inequality, Ornstein-Zernike asymptotics, random environments, determinantal expressions for systems including exclusion processes (stochastic lattice gas, Kawasaki dynamics), zero range processes, interacting Brownian particles, random walks, self-avoiding walks, Ginzburg-Landau model, interface models, Ising model,

Widom-Rowlinson model, directed polymers, random matrices, Dyson's model and others.

The conferences were supported by the Mathematical Society of Japan, the Japan Association for Mathematical Sciences, the Japan Society for the Promotion of Science, and RIMS, Kyoto University. We are grateful to their generous financial supports.

We thank all the speakers and the participants for their invaluable contributions which made the conferences most successful. We also thank all the referees for their help to this volume by carrying out painful but excellent jobs.

June, 2003

Tadahisa Funaki
Hirofumi Osada

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

CONTENTS

7.6 Advanced Studies in Pure Mathematics, Vol. 40 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 40

Chief Editor: Eiichi Bannai (Kyushu University)

Representation Theory of Algebraic Groups and Quantum Groups

Edited by

Toshiaki Shoji (Nagoya University)
Masaki Kashiwara (RIMS, Kyoto University)
Noriaki Kawanaka (Osaka University)
George Lusztig (MIT)
Ken-ichi Shinoda (Sophia University)

Mathematical Society of Japan

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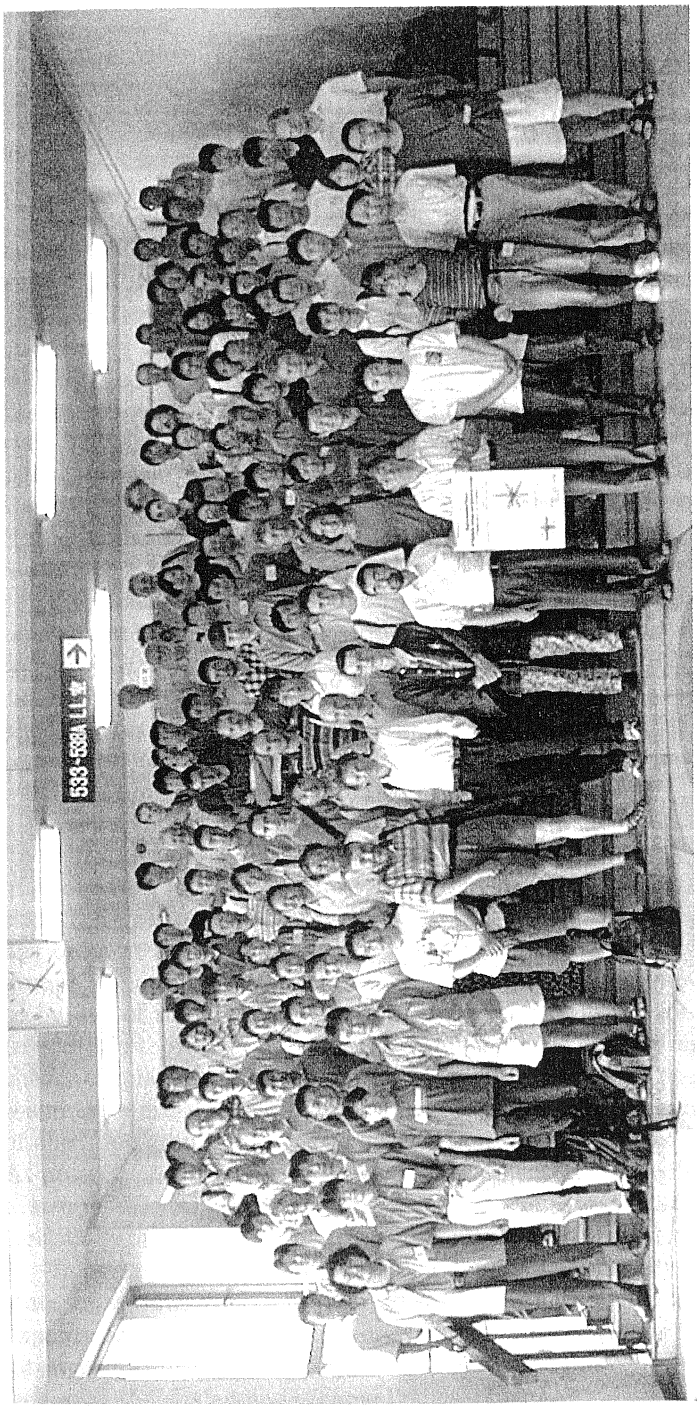
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Preface

The conference "Representation Theory of Algebraic Groups and Quantum Groups" was held at Sophia University in Tokyo from August 1 to 10, 2001, as the 10th International Research Institute of the Mathematical Society of Japan (MSJ-IRI).

During the conference, there were 29 lectures by invited speakers, including a series of survey lectures by Seok-Jin Kang, Hiraku Nakajima, George Lusztig, Olivier Mathieu and Jens Carsten Jantzen. There were 173 participants including 59 from overseas. A lot of young researchers from 14 countries attended the conference, from Australia, Canada, Chile, China, Denmark, France, Germany, Japan, Korea, the Netherlands, Switzerland, Russia, the United Kingdom and the United States.

The conference was planned to focus on recent developments in the representation theory of algebraic groups and quantum groups. The topics covered modular representations of algebraic groups, representations of quantum groups and crystal bases, representations of affine Lie algebras, representations of affine Hecke algebras, modular or ordinary representations of finite Chevalley groups, representations of complex reflection groups and associated Hecke algebras.

There had been an international conference in 1983 at Kyoto on "Algebraic groups and related topics". It was twenty years ago, and some of our invited speakers also participated in the Kyoto's conference. Since then, the discovery of quantum groups by Drinfel'd and Jimbo in 1980's has brought a drastic change to the representation theory of algebraic groups. The representation theory of quantum groups grew up quickly to be one of the main themes in the representation theory of Lie type. In addition to its own interest, it became noticed that the representation theory of quantum groups produces a striking bridge connecting various seemingly unrelated subjects, such as the modular representation theory of algebraic groups and the representation theory of affine Lie algebras. At present, the interactions between those theories are getting tight, and active researches are being done involving the representation theory of Hecke algebras, from geometric and combinatorial point of view.

In organizing the conference, we intended to summarize the present state of various representation theories through the talks by leading experts, and to give a chance for young researchers to be in touch with latest results by those experts. We believe that our aim was achieved well, and the conference became really exciting.

The present volume is the Proceedings of the conference. It contains 17 articles (plus one appendix) contributed by the invited speakers of the conference. Some of them are expository papers, which will give nice perspectives on those subjects for readers.

The study of algebraic groups in Japan was initiated by Professor Nagayoshi Iwahori. The Iwahori-Hecke algebra introduced by him turned out to be a fundamental tool, not only in the representation theory of algebraic groups, but also in wider areas such as knot theory and mathematical physics. He made a remarkable influence on the growth of the representation theory in Japan, and a lot of researchers in Japan nowadays benefited much from him. It is our pleasure to thank Professor Iwahori for such a big contribution to this area.

We express our hearty thanks to all the invited speakers for their interesting and stimulating talks, and to all the participants for their interests to the conference.

We would like to thank the Mathematical Society of Japan for their financial support for the conference. The conference was also supported by the Japan Association for Mathematical Sciences, and by the Grant-in-Aid for Scientific Research by Japan Society for the Promotion of Science. We thank them for their financial supports.

September 2003

Editorial Committee
Toshiaki Shoji
Masaki Kashiwara
Noriaki Kawanaka
George Lusztig
Ken-ichi Shinoda

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

Mathematical Society of Japan - 10th International Research Institute

Representation Theory of Algebraic Groups and Quantum Groups

DATE: August 1 – 10, 2001
PLACE: Sophia University, Tokyo, Japan

PROGRAM

August 1 (Wednesday)

13:45 – 14:45 **T. Tanisaki**
Highest weight modules over affine Lie algebras
15:00 – 16:00 **K. Saito**
Elliptic Lie groups
16:30 – 17:30 **S. -J. Kang**
Quantum groups and crystal bases

August 2 (Thursday)

10:00 – 11:00 **S. -J. Kang**
Perfect crystals and Young walls
11:15 - 12:15 **A. Zelevinsky**
An introduction to cluster algebras
13:45 - 14:45 **M. Broué**
Families of characters of cyclotomic Hecke algebras
15:00 - 16:00 **N. Xi**
A property of distinguished involutions in an affine Weyl group of type $\tilde{A}_n$
16:30 - 17:30 **S. Ariki**
The representation type of Hecke algebras of type B

August 3 (Friday)

10:00 - 11:00 **S. -J. Kang**
Fock space representation of quantum affine algebras
11:15 - 12:15 **H. Nakajima**
Quiver varieties and quantum affine algebras, I
13:45 - 14:45 **M. Kashiwara**
On semisimple holonomic module conjecture

15:00 - 16:00 **A. Kleshchev**
Projective representations of symmetric groups via Kac-Moody algebras
16:30 - 17:30 **S. Naito**
Twining character formula for Demazure modules

August 4 (Saturday)

10:00 - 11:00 **H. Nakajima**
Quiver varieties and quantum affine algebras, II
11:15 - 12:15 **G. Lusztig**
Representations of graded Hecke algebras, I

August 6 (Monday)

10:00 - 11:00 **G. Lusztig**
Representations of graded Hecke algebras, II
11:15 - 12:15 **H. Nakajima**
Quiver varieties and quantum affine algebras, III
13:45 - 14:45 **E. Vasserot**
D-modules, formal loop spaces and chiral algebras
15:00 - 16:00 **V. Ostrik**
Asymptotic Hecke algebra and central sheaves
16:30 - 17:30 **A. Gyoja**
Prehomogeneous vector spaces and representations

August 7 (Tuesday)

10:00 - 11:00 **O. Mathieu**
Connections on stable bundles, I
11:15 - 12:15 **G. Lusztig**
Representations of graded Hecke algebras, III
13:45 - 14:45 **H.H. Andersen**
Small cells and fusion rules
15:00 - 16:00 **S. Arkhipov**
Algebraic construction of quasi-Verma modules in positive characteristic
16:30 - 17:30 **M. Kaneda**
On the Beilinson-Bernstein correspondence on the flag variety in positive characteristic

August 8 (Wednesday)

10:00 - 11:00 **J.C. Jantzen**
Representations of Lie algebras in prime characteristics, I

11:15 - 12:15 **O. Mathieu**
Connections on stable bundles, II

13:45 - 14:45 **A. Kirillov**
Birational representations of symmetric groups, combinatorics and discrete integrable equations

15:00 - 16:00 **A. Mathas**
Tilting modules for cyclotomic Schur algebras

16:30 - 17:30 **T.A. Springer**
Intersection cohomology of large Schubert varieties

August 9 (Thursday)

10:00 - 11:00 **O. Mathieu**
Connections on stable bundles, III

11:15 - 12:15 **J.C. Jantzen**
Representations of Lie algebras in prime characteristics, II

13:45 - 14:45 **R. Bezrukavnikov**
Localization type Theorems for modular representations and representations of quantum groups at a root of unity

15:00 - 16:00 **M. Noumi**
Birational Weyl group actions, discrete integrable systems and tropical combinatorics

16:30 - 17:30 **C.W. Curtis**
On the Gelfand-Graev representations of finite reductive groups: Zeta functions and functional equations

August 10 (Friday)

10:00 - 11:00 **J.C. Jantzen**
Representations of Lie algebras in prime characteristics, III

11:15 - 12:15 **G.I. Lehrer**
Cell modules and standard modules for the affine Hecke algebra of type A

13:45 - 14:45 **N. Kawanaka**
Sato-Welter games and Weyl groups of Kac-Moody Lie algebras

15:00 - 16:00 **T. Shoji**
Green functions associated to complex reflection groups

CONTENTS

7.7 Advanced Studies in Pure Mathematics, Vol. 41 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 41

Chief Editor: Eiichi Bannai (Kyushu University)

Stochastic Analysis and Related Topics in Kyoto

In honour of Kiyosi Itô

Edited by

Hiroshi Kunita (Nanzan University, Editor in chief)
Shinzo Watanabe (Ritsumeikan University)
Yoichiro Takahashi (RIMS, Kyoto University)

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Preface

This book is based on lectures given at the conference "Stochastic analysis and the related topics" held at RIMS, Kyoto University in Sept. 4-7, 2002, which is the biggest meeting of RIMS International Project (Research), 2002. The conference consisted of three sessions on Stochastic analysis and a special session celebrating of Professor Kiyosi Itô on the occasion of *Beiju*. It means 88th birthday in Japanese. Actually on Sept. 7th, 2002, Kiyosi Itô celebrated his 88th birthday counting ages in the traditional way or his 87th birthday counting in the western way.

Kiyosi Itô was a professor of Kyoto University during 1952-1979. There he brought up a number of students. In the meantime he often visited United States and European countries, where he encountered some friends, colleagues and students. In the ceremonial session, the organizing committee invited, both from foreign countries and from Japan, 11 mathematicians who had a close relationship with Kiyosi Itô for a long time. We regret that we missed many friends of him, whom he might have wished to meet in Kyoto.

Topics of sessions on Stochastic analysis that we selected were Mathematical finance, Markov processes and Malliavin calculus. These sessions are by no means independent of the ceremonial ssesion. Itô's stochastic calculus initiated in 1942 by himself alone is now recognized widely as a most fundamental theory in Stochastic analysis. We cannot talk about Mathematical finance without Itô's formula. Itô's stochastic differential equation is a key object in the theory of Markov process and Malliavin calculus. We invited another 11 mathematicians who are working now actively in these fields of stochastic analysis.

Members of the organizing committee of the conference were Masatoshi Fukushima, Shigeo Kosuoka, Hideo Nagai, Ichiro Shigekawa and ourselves. Takashi Kumagai worked for the preparation of the conference as a secretary. We thank them all. It is ultimately Professor Itô himself whom we wish to thank; our great teacher. *Arigatô gozaimasu.*

Shinzo Watanabe
Hiroshi Kunita
Yoichiro Takahashi

Kyoto, September 2003

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

A note of thanks by K. Itô

I would like to express my deepest appreciation to the organizers of this international symposium on stochastic analysis. I feel most honored that the special session was dedicated to celebrating my 88th Beiju birthday.

When I started my study of mathematics at Tokyo University, the most popular field of mathematics in Japan was number theory, but I myself was not successful at it. One day, I saw Kolmogorov's book on measure theoretical probability theory at the Maruzen bookstore in Tokyo. If I recall correctly, my university classmates, K. Kodaira and Y. Kawada, were also there with me in the bookstore. As I was only a first-year student, it was much too difficult for me to understand, but sooner or later I came to enjoy this rigorous description. Later I read Paul Lévy's book on infinite divisible probability distribution and stochastic processes, which seemed to me more profound and more attractive even though less rigorous. My Ph.D. thesis in 1942 was devoted to making Paul Lévy's theory as rigorous as Kolmogorov's theory. Afterwards, my interests were naturally directed to the theory of Markov processes and diffusion processes, of which an analytic theory had been formulated by Kolmogorov. Pursuing the study of the sample paths of processes in the same way as additive processes, I finally succeeded in introducing stochastic differential equations. Next, I tried to describe paths of one-dimensional Feller's diffusions. I owe the success of my project to Henry McKean, without whose collaboration this research would not have been possible.

I was born on September 7th, 1915, so I am eighty-seven years old today. But counting the day that I was born as my first birthday, today is my eighty-eighth birthday (Beiju), and it will undoubtedly be one of the most extraordinary and memorable birthdays in my lifetime. I had never thought that I would live so long, and my only regret is that my wife, my constant companion of sixty-two years, whom many of you know as Mrs. Itô, is no longer here to share this happy moment with me.

During this symposium, I learned of many new and exciting recent developments in stochastic analysis, and I feel encouraged to also pursue probability theory for another ten years. Let me again express my most sincere thanks to the symposium organizers and to all the participants for this special session and party celebrating my eighty-eighth birthday. Thank you very much.

Kiyosi Itô
September 7th, 2002

CONTENTS

7.8 Advanced Studies in Pure Mathematics, Vol. 42 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 42

Chief Editor: Eiichi Bannai (Kyushu University)

Complex Analysis in Several Variables — Memorial Conference of Kiyoshi Oka's Centennial Birthday Kyoto/Nara 2001

Edited by

Kimio Miyajima (Kagoshima University)
Mikio Furushima (Kumamoto University)
Hideaki Kazama (Kyushu University)
Akio Kodama (Kanazawa University)
Junjiro Noguchi (The University of Tokyo)
Takeo Ohsawa (Nagoya University)
Hajime Tsuji (Sophia University)
Tetsuo Ueda (Kyoto Univesity)

Mathematical Society of Japan

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Advanced Studies in Pure Mathematics 42

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Preface

The present conference was held to commemorate the centennial birthday of late Professor Kiyoshi Oka in the fall of 2001 from October 30th through November 5th at Kyoto and from November 6th through 8th at Nara. This volume contains the records and the contributed articles based on the talks delivered at the conference, and is dedicated to the memory of Kiyoshi Oka.

It is our great pleasure to include a letter of Professor Henri Cartan written for this conference. As we planned to ask Professor H. Cartan to write some words for this memorial conference and had a contact with him, we learned that he had written such a letter already, being asked by Professor Jean Pierre Serre. Soon later we were informed that it was organized so by Professor Reinhold Remmert. Unfortunately, Professor R. Remmert was unable to come to the conference because of his health condition, but the letter was presented and read by Masakazu Suzuki at the opening. We sincerely express our deepest gratitude to Professor R. Remmert for his kind arrangement.

Since there is included a survey article by Toshio Nishino on K. Oka, we limit here ourselves only to make a brief comment how the conference was organized. The idea to hold such a conference for K. Oka came up about four years ago in a small number of Japanese colleagues working in complex analysis in several variables. Then in the spring of 2000, it swiftly grew up among broader people. The initial organizing committee was formed in summer, 2000, and then it had been enlarged to the present one. We sincerely appreciate the kindness of the family of late Professor K. Oka who accepted the idea of the present conference with pleasure.

Speakers were invited not only from those in complex analysis in several variables, but also from those in neighboring areas to which the work of K. Oka has given influences.

In 1999 the remaining manuscripts and memoranda of K. Oka were donated to Nara Women's University Library by his family. Nara Women's University Library run a special exhibition of the Oka Collection including those manuscripts and memoranda for the national holiday of culture, November 3rd., actually, 1st to 8th at the Memorial Auditorium of Important Cultural Property. The dates of this memorial conference had been selected, so that it was coherent to the special exhibition.

The first part of the conference at Kyoto was held as a special program of Research Institute of Mathematical Sciences, Kyoto University, and the second part at Nara was held under the joint sponsorship of

Nara Women's University Library, to both of which our deep thanks are due. The conference was made possible by the financial supports of scientific research funds of the ministry, Monbukagakusho, Grant-in-Aid for Scientific Research (A)(1) 12304007 represented by H. Fujimoto, Grant-in-Aid for Scientific Research (B)(1) 12440035 represented by T. Ohsawa, and Grant-in-Aid for Scientific Research (A)(1) 13304009 represented by J. Noguchi, to which we are very grateful.

J. Noguchi
August 2003

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

CONTENTS

7.9 Advanced Studies in Pure Mathematics, Vol. 43 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 43

Chief Editor: Toshitake Kohno (The University of Tokyo)

Singularity Theory and Its Applications

Edited by

Shyuichi Izumiya (Hokkaido University)
Goo Ishikawa (Hokkaido University)
Hiroo Tokunaga (Tokyo Metropolitan University)
Ichiro Shimada (Hokkaido University)
Takasi Sano (Hokkaigakuen University)

Mathematical Society of Japan

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Preface

The 12th MSJ International Research Institute of the Mathematical Society of Japan 2003 "*Singularity theory and its applications* " was held on Sapporo convention center "SORA", September 16–25, 2003. The conference was attended by 146 mathematicians, 77 of them from 17 different countries outside of Japan, and there were 97 talks. The programme covered a broad range of topics in singularity theory and its applications. The local organizers were S. Izumiya, G. Ishikawa, I. Shimada and T. Sano. The scientific committee consisted of Professors J. Damon (Chapell-Hill), T. Fukuda (Tokyo), S. Janeczko (Warsaw), M. Oka (Tokyo), M. A. Ruas (Sao Carlos), K. Saito (Kyoto), D. Siersma (Utrecht), C. T. C. Wall (Liverpool) and V. Zakalyukin (Moscow). Professor Heisuke Hironaka (Tokyo) was the advisor of the conference. The local organizers would like to thank all the members of the scientific committee and the advisor.

The papers presented here are selection of those submitted to the editors for the publication in the proceedings of the meeting. They cover several important topics in singularity theory such as motivic integrations, Thom polynomials, complex analytic singularity theory, Lagrangian singularity theory, generic differential geometry etc. All papers were refereed and in final form. We would like to express our gratitude to the authors and the many referees.

We gratefully acknowledge financial support from Mathematical Society of Japan; Grant-in-Aid for Scientific Research, JSPS; Ministry of Education, Culture, Sports Science and Technology, Japan; Sapporo International Communication Plaza Foundation; Grant-in-Aid for formation of COE "Mathematics of Nonlinear structure via Singularities"(Hokkaido University). We also thank to the staff at Department of Mathematics, Hokkaido University for their enormous help and support. Finally many thanks to Atsuko Ogino and Megumi Sasamori for doing so much of the editorial work of this volume in their friendly and efficient manner.

Sapporo, December 2005

Shyuichi Izumiya, Goo Ishikawa, Hiroo Tokunaga,
Ichiro Shimada, Takasi Sano
Editors

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

CONTENTS

7.10 Advanced Studies in Pure Mathematics, Vol. 44 表紙, 序文, 目次

ADVANCED STUDIES IN PURE MATHEMATICS 44

Chief Editor: Toshitake Kohno (The University of Tokyo)

Potential theory in Matsue

Edited by

Hiroaki Aikawa (Hokkaido University)
Takashi Kumagai (RIMS, Kyoto University)
Yoshihiro Mizuta (Hiroshima University)
Noriaki Suzuki (Nagoya University)

Mathematical Society of Japan

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Advanced Studies in Pure Mathematics 44

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Preface

This volume collects, in written form, eight plenary lectures and twenty-five selected contributions from invited and contributed lectures delivered at the International Workshop on Potential Theory 2004. The workshop was held at Shimane University, Matsue, Japan, from 23 to 28 August, 2004. There were 19 plenary lectures and 35 invited and contributed lectures with 77 participants coming from 15 countries.

The topic of the workshop was Potential Theory and its related fields. There were stimulus talks from classical potential theory to pluri-potential theory and probabilistic potential theory. The organizing committee consisted of Hiroaki Aikawa (chairman), Takashi Kumagai, Fumi-Yuki Maeda, Hiroaki Masaoka, Yoshihiro Mizuta, Minoru Murata, Masaharu Nishio, Takeo Ohsawa, Katsunori Shimomura, Noriaki Suzuki, Maretsugu Yamasaki; together with local organizers at Shimane University, Daishi Kuroiwa, Shuji Machihara, Toshihiro Nakanishi and Hiroyuki Tsutsumi.

We are very grateful to all institutions and individuals who have supported the workshop. We would like to express our sincere thanks to Professor Masatoshi Fukushima and Professor Jun Kigami who are willing to deliver plenary lectures as well as to support international participants. Professor Junjiro Noguchi kindly offers his grant to invite many participants. His grant is one of our main resources. Professor Minoru Murata, Professor Masaharu Nishio and Professor Takeo Ohsawa of the IWPT organizers also help international participants financially. We would like to acknowledge the supports by

Shimane Prefecture,
Matsue City,
Grant-in-Aid for Scientific Research, Japan Society for the Promotion of Science.

Their generous supports were necessity for the workshop as well as for this volume of the proceedings.

The present volume owes much to the selfless service of many referees who carefully read the submitted the manuscripts. Finally, our thanks go to Ms Yuko Kameda at the COE program office of Hokkaido University for her help in the preparation of the final manuscripts.

Sapporo, March 2006

The Editors:
Hiroaki Aikawa (Chief)
Takashi Kumagai
Yoshihiro Mizuta
Noriaki Suzuki

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

International Workshop on Potential Theory 2004, Matsue

Venue: Shimane University, Matsue, Japan

Period: August 23–28, 2004

Monday, August 23

18:00-20:00 **IWPT Reception**

Tuesday, August 24

9:25-9:30 **IWPT opening**

Plenary lectures

9:30-10:30 **Stephen J. Gardiner**
Radial limits of harmonic functions

11:00-12:00 **Jun Kigami**
Resistance forms and heat kernel estimates on fractals

12:00-12:10 **Photo**

13:30-14:30 **Nageswari Shanmugalingam**
Dirichlet forms and Newton-Sobolev spaces for metric spaces supporting Poincare inequalities

Lectures in parallel sessions

15:00-15:30 **Olli Martio**
Poisson modifications for quasisuperminimizers

Jürgen Bliedtner
Convergence properties of semi-elliptic differential operators

Manfred Stoll
On generalizations of the Littlewood-Paley inequalities to domains in $\mathbb{R}^n$ $(n \geq 2)$

15:45-16:15 **Jana Björn**
Boundary regularity for p-harmonic functions on metric spaces

Klaus Janssen
Integral representation for space-time excessive functions

Hong Rae Cho
Capacitary inequalities for mean Lipschitz spaces on the unit ball in $\mathbb{C}^n$

16:30-17:00 **Takayori Ono**
Hölder continuity of solutions to quasilinear elliptic equations with measure data

Torbjörn Lundh
Minimally thin sets below a function graph

E. G. Kwon
M-subharmonic Hardy functions on the complex ball

17:15-17:45 **Shin-ichi Ohta**
Cheeger-type Sobolev spaces for metric space targets

Kentaro Hirata
An estimate for the product of the Green function and the Martin kernel

Yûsuke Okuyama
Poincaré functions and the value distributions in complex dynamics

Wednesday, August 25

Plenary lectures

9:30-10:30 **Krzysztof Burdzy**
Neumann eigenfunctions and Brownian couplings

11:00-12:00 **Pekka Koskela**
One-dimensional measure of a preimage

13:30-14:30 **Jang-Mei Wu**
Quasiconformal deformation of self-similar sets and applications

Lectures in parallel sessions

15:00-15:30 **Minoru Murata**
Representations of nonnegative solutions for parabolic equations

Rikio Yoneda
The essential norm of the integration operators and Multipliers on Bergman spaces

Takahide Kurokawa
On a decomposition of the Schwartz class

15:45-16:15 **Yehuda Pinchover**
Large time behavior of the heat kernel

Katsuya Ishizaki
Borel and Julia directions of meromorphic Schröder functions

Yoichi Miyazaki
The L^p resolvents for elliptic systems of divergence form

16:30-17:00 **Fausto Di Biase**
On tangential approach regions for bounded harmonic functions in the unit disc

Akane Iwamura
Estimates of the α-Riesz potentials in metric spaces

Minoru Yanagishita
On the behavior at infinity for non-negative superharmonic functions in a cone

17:15-17:45 **Kohur GowriSankaran and David Singman**
Boundary behaviour on trees

Hisako Watanabe
Estimates of maximal functions by Hausdorff contents in a metric space

I. Miyamoto and H. Yoshida
A covering theorem and a quantitative property of minimally thin sets in a cone

Thursday, August 26

Plenary lectures

9:30-10:30 **Masatoshi Fukushima**
Trace Dirichlet forms and related topics

11:00-12:00 **Stephanie Nivoche**
A Hilbert lemniscate theorem in $\mathbb{C}^n$

Friday, August 27

Plenary lectures

9:30-10:30 **Yves Guivarc'h**
Martin boundaries of skew products, and orbit closures of linear group actions

11:00-12:00 **Joaquim Ortega and Kristian Seip**
Harmonic measure in Swiss cheeses

13:30-14:30 **Tom Carroll**
Harmonic measure in parabola-shaped regions in $\mathbb{R}^n$

Lectures in parallel sessions

15:00-15:30 **Krzysztof Bogdan (joint work with Paweł Sztonyk)**
Harnack's inequality for stable Lévy processes

Tero Kilpeläinen
p-Laplacian problems near the boundary

Hiroaki Masaoka
Quasiconformal mapping and the minimal Martin boundary of covering surfaces of the punctured Riemann sphere $\hat{\mathbb{C}} \setminus \{0\}$ of Heins type

15:45-16:15 **Renming Song**
Potential theory of special subordinators and subordinate killed Brownian motions

Hyungwoon Koo
Holomorphic mean Lipschitz spaces

Tetsu Shimomura
Sobolev embeddings for variable exponent Riesz potentials

16:30-17:00 **Katsunori Shimomura**
The caloric morphism for radial metrics on semi-euclidean spaces.

Boo Rim Choe
Non-orthogonal projections for harmonic Bergman spaces

Yoshihiro Mizuta
Continuity properties for weakly monotone Sobolev functions

17:15-17:45 **Masaharu Nishio, Katsunori Shimomura and Noriaki Suzuki**

L^p-boundedness of Bergman projections for α-parabolic operators

Premalatha and A. K. Kalyani
Some potential theoretic results on an infinite network

Saturday, August 28

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11:00-12:00 **Wolfhard Hansen**
Global comparison of perturbed Green functions

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ADVANCED STUDIES
IN PURE MATHEMATICS 45

Chief Editor: Toshitake Kohno (The University of Tokyo)

Moduli Spaces and Arithmetic Geometry (Kyoto, 2004)

Edited by

Shigeru Mukai (RIMS, Kyoto University)
Yoichi Miyaoka (University of Tokyo)
Shigefumi Mori (RIMS, Kyoto University)
Atsushi Moriwaki (Kyoto University)
Iku Nakamura (Hokkaido University)

Mathematical Society of Japan

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Preface

Since its birth algebraic geometry has been closely related to and deeply motivated by number theory. Particularly the modern study of moduli spaces and arithmetic geometry have many important techniques and ideas in common. With this close relation in mind, the RIMS conference "Moduli Spaces and Arithmetic Geometry" was held at Kyoto University during September 8–15, 2004 as the 13th International Research Institute of the Mathematical Society of Japan (MSJ-IRI). This volume is the outcome of this conference and consists of thirteen papers, which were rigorously refereed. We would like to thank all the referees for their contribution to this volume.

November 2006

Editorial Committee
Shigeru Mukai (Chief)
Yoichi Miyaoka
Shigefumi Mori
Atsushi Moriwaki
Iku Nakamura

All papers in this volume have been refereed and are in final form. No version of any of them will be submitted for publication elsewhere.

This volume is respectfully dedicated to

Prof. Masaki Maruyama

on his sixtieth birthday in 2004
from all of us who owe so much to him
through both his works and personal guidance.

The 13th Mathematical Society of Japan International Research Institute — Moduli Spaces and Arithmetic Geometry —

The conference "Moduli Spaces and Arithmetic Geometry" was held in 2004, when Professor Masaki Maruyama turned sixty (*kanreki* in Japanese). Professor Maruyama received his Bachelor of Arts in 1967, his Master of Arts in 1969, and his Dr. of Sci. in 1972, all from Kyoto University. He published parts of his master's thesis as a book, which was quite unusual in mathematics. In his master's and doctoral theses, he established the theory of elementary transformation, a construction principle of algebraic vector bundles over bases of dimension up to three. He became a research associate of Kyoto University after he received his MA, and visited Harvard University for one year after he received his Dr. of Sci. Since this visit, he has been working on various aspects of moduli problems*. He has visited many places overseas and supervised scores of students.

In this conference, there were 153 participants including 20 from overseas. There were five series lectures and eight one-hour lectures by invited speakers. The present volume consists of eight articles by invited speakers and five by participants. We thank all the speakers and participants for their invaluable contributions, which made the conference most successful.

The conference was supported by the Mathematical Society of Japan, Research Institute for Mathematical Sciences (RIMS) and the Grant-in-Aid for Scientific Research† of the Japan Society of Promotion of Science. We are grateful for their generous financial support.

November 2006

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Shigeru Mukai
Atsushi Moriwaki
Yoichi Miyaoka
Shigefumi Mori
Iku Nakamura
Masa-Hiko Saito
Fumiharu Kato

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*The list of his publications is in the following pages.

†(A)(1) No. 14204001 (S. Kondo), (A)(1) No. 16204001 (I. Nakamura) and (B)(1) No. 16340009 (M.-H. Saito).

1. (with M. Nagata) Note on the structure of a ruled surface, J. Reine Angew. Math. **239/240** (1969), 68–73.
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4. On a family of algebraic vector bundles, '*Number theory, algebraic geometry and commutative algebra, in honor of Yasuo Akizuki*', pp. 95–146. Kinokuniya, Tokyo, 1973.
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14. Moduli of stable sheaves—generalities and the curves of jumping lines of vector bundles on $\mathbf{P}^2$, '*Algebraic varieties and analytic varieties (Tokyo, 1981)*', pp. 1–27, Adv. Stud. Pure Math., **1**, North-Holland, Amsterdam, 1983.

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29. (with M. Nagata and M. Miyanishi) *Abstract algebraic geometry* (Japanese), Kyoritsu Shuppan Co., Ltd., Tokyo, 1982, viii + 258 pp.

30. *Gröbner bases and their application*, (Japanese), Kyoritsu Shuppan Co., Ltd., Tokyo, 2002, ix + 258 pp.

Professor Maruyama

Program

Dates: September 8–15, 2004

Venue: Research Institute for Mathematical Sciences, Kyoto University, Kyoto, Japan

September 8 (Wednesday)

13:00–13:15 Opening
13:15–14:15 **S. Mukai** (RIMS)
Moduli of vector bundles, I.
14:30–15:30 **C. Soulé** (IHES)
Arakelov Geometry, I.
16:30–17:30 **I. Nakamura** (Hokkaido)
Degenerate abelian varieties of type E_8.

September 9 (Thursday)

10:00–11:00 **C. Faber** (Stockholm)
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11:15–12:15 **C. Soulé** (IHES)
Arakelov Geometry, II.
14:00–15:00 **C. Voisin** (Paris)
On homotopy types of Kähler compact manifolds and the Kodaira problem.
16:00–17:00 **A. Beauville** (Nice)
Vector bundles on curves and theta functions.

September 10 (Friday)

10:00–11:00 **C. Faber** (Stockholm)
Cohomology of local systems on moduli spaces of curves and of abelian varieties, II.
11:15–12:15 **C. Soulé** (IHES)
Arakelov Geometry, III.
14:00–15:00 **Y. Laszlo** (Paris)
Vector bundles in positive characteristic.
16:00–17:00 **S. Mukai** (RIMS)
Moduli of vector bundles, II.

September 13 (Monday)

10:00–11:00 **K. Fujiwara** (Nagoya), **F. Kato** (Kyoto)
Rigid geometry, I.

11:15–12:15 **C. Faber** (Stockholm)
Cohomology of local systems on moduli spaces of curves and of abelian varieties, III.

14:00–15:00 **S. Mochizuki** (RIMS)
Anabelian Geometry from an Inter-universal Point of View, I.

16:00–17:00 **K. Kato** (Kyoto)
Moduli spaces of Hodge structures and log abelian varieties.

September 14 (Tuesday)

10:00–11:00 **K. Fujiwara** (Nagoya), **F. Kato** (Kyoto)
Rigid geometry, II.

11:15–12:15 **S. Mochizuki** (RIMS)
Anabelian Geometry from an Inter-universal Point of View, II.

14:00–15:00 **R. Hain** (Duke)
On the symplectic cohomology of hyperelliptic mapping class groups.

16:00–17:00 **N. Nitsure** (TIFR)
Moduli of regular holonomic D-modules with natural parabolic semi-stability

September 15 (Wednesday)

10:00–11:00 **K. Fujiwara** (Nagoya), **F. Kato** (Kyoto)
Rigid geometry, III.

11:15–12:15 **S. Mochizuki** (RIMS)
Anabelian Geometry from an Inter-universal Point of View, III.

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ADVANCED STUDIES IN PURE MATHEMATICS 46

Chief Editor: Toshitake Kohno (The University of Tokyo)

Singularities in Geometry and Topology 2004

Edited by

Jean-Paul Brasselet (Institut de Mathématiques de Luminy)
Tatsuo Suwa (Niigata University)

Mathematical Society of Japan

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序文

日本数学会刊行シリーズ Advanced Studies in Pure Mathematics の一つとして出版されるこの巻は 2004 年 9 月 13 日から 18 日まで北海道大学（札幌）で開催された日仏特異点シンポジウム “幾何学とトポロジーにおける特異点” の報告集です．これは同標題の第三回目のシンポジウムです：第一回の日仏特異点シンポジウムは 1998 年 7 月 6 日から 10 日まで北海道大学で開催され，その報告集はこのシリーズ Advanced Studies in Pure Mathematics の第 29 巻として 2000 年に出版されました．また第二回は 2002 年 9 月 9 日から 13 日まで CIRM（マルセイユ - リュミニ）で開催され，その報告集はフランス数学会刊行シリーズ Séminaires et Congrès の第 10 巻として 2005 年に出版されています．

特異点理論における日仏の協力関係は古く，それは 1970 年代の廣中平祐のフランス滞在を契機に具体化されました．日本学術振興会と CNRS の協力事業および PICS(科学協力国際プログラム) により相互派遣，研究交流が可能となり，また日仏両国におけるポストドックに財政援助が与えられました．

北海道大学における今回のシンポジウムは日本学術振興会とCNRS の日仏協力事業 “日仏セミナー” の一つとして組織されました．主に日仏両国，またドイツ，イラン，メキシコ，ロシア，トルコ，アメリカ合衆国，ベトナム などの諸国より計 60 名の参加者がありました．講演は 23 あり，主として特性類，留数，階層化，曲線および曲面の特異点，附値，特異点の解消，トーリック多様体などの主題について行われました．

フランス大使館からは，駐日大使 Bernard de Montferrand 氏に開会式に御挨拶をして頂く光栄に浴しました．また科学技術顧問 Michel Israël 氏が参加して下さったことにも感謝いたします．フランス大使館をはじめ，このシンポジウムの実現に援助して下さった方々，特に日本学術振興会，CNRS に感謝いたします．東京の CNRS 事務局にも支援をして頂きました．最後になりましたが，有能，意欲的かつ懇切な尽力によりこのシンポジウムを真に成功させて下さった北海道大学 COE 事務員の方々にお礼申し上げます．

Jean-Paul Brasselet, 諏訪 立雄

PRÉFACE

Ce volume de la Série Advanced Studies in Pure Mathematics de la Société Mathématiques du Japon constitue les Actes du Colloque Franco-Japonais de Singularités en Géométrie et Topologie, tenu à l'Université d'Hokkaido (Sapporo, Japon) du 13 au 18 Septembre 2004. Il s'agit du troisième colloque de ce nom : le premier colloque Franco-Japonais de Singularités s'est tenu à l'Université d'Hokkaido du 6 au 10 Juillet 1998 et a été publié comme volume de la présente Série, Advanced Studies in Pure Mathematics, volume 29, 2000, le second s'est tenu au CIRM, à Marseille-Luminy du 9 au 13 Septembre 2002 et a été publié comme volume de la Série Séminaires et Congrès de la Société Mathématiques de France, Numéro 10, 2005.

La coopération franco-japonaise dans le domaine des singularités est ancienne et s'est concrétisée à l'occasion des séjours en France du Professeur Heisuke Hironaka dans les années 1970. Un accord bilatéral CNRS/JSPS puis un PICS (Programme International de Coopération Scientifique) ont permis de réaliser des missions de travail, des rencontres et ont servi de support à des postes de post-doctorants au Japon et en France.

Le colloque de Sapporo a été organisé comme "Séminaire bilatéral conjoint" franco-japonais CNRS/JSPS et comme l'une des activités du PICS. Il a rassemblé 60 participants, essentiellement du Japon et de France, mais aussi d'autres pays tels que Allemagne, Iran, Mexique, Russie, Turquie, USA, Viet Nam. Les conférences, au nombre de 23, ont eu comme thèmes principaux les classes caractéristiques, les résidus, les stratifications, les singularités de courbes et de surfaces, les valuations, la résolution des singularités, les variétés toriques.

Monsieur Bernard de Montferrand, Ambassadeur de

France au Japon, nous a fait l'honneur de présider la séance d'ouverture. Nous tenons à l'en remercier ainsi que Monsieur Michel Israël, Conseiller pour la Science et la Technologie, lequel a participé aux activités du congrès. Outre l'aide précieuse de l'Ambassade de France nous avons bénéficié du support de la JSPS et du CNRS ; la représentation du CNRS à Tokyo, en la personne de Denis Perret-Gallix, nous a apporté son soutien. Nous les en remercions ainsi que toutes celles et tous ceux qui nous ont aidé à réaliser ce colloque. Nos remerciements vont tout particulièrement au secrétariat du COE du Département de Mathématiques de l'Université d'Hokkaido qui par sa compétence, sa disponibilité et sa gentillesse, a permis de faire de ce colloque un réel succès.

Jean-Paul Brasselet
Tatsuo Suwa

フランス大使講演要旨

駐日フランス大使 Bernard de Montferrand 氏はシンポジウムの開会式に臨席されました. 氏の御講演の原稿は東京のフランス大使館の御好意により, この巻にフランス語で掲載させて頂きます. これは日本語によるその要旨です.

数学はフランスおよび日本に共通した優れた分野ですので, 大使がこの数学のシンポジウムに出席するのは適切なことだと思います. 日本はフランスと同様, 偉大な数学者を生み出しています. 基礎的研究における二国間の協力は豊富で実り多いものです. 基礎的研究は技術の進歩の源にあり, 数学は知的活動の本質です.

特異点理論は日仏科学協力のシンボルです. 特異点理論における日仏間の最初の接触は 1968 年の廣中平祐のフランス IHES への訪問に遡ります. 特異点理論における多くの日本人数学者がフランス語を話すのは注目すべき点です. 諏訪立雄と Jean-Paul Brasselet を責任者とする, 1995 年から 2001 年の CNRS と JSPS 間の特異点における協力事業により, 我々二つのグループ間の協力が具体化されました. そしてこれは 2001 年からの CNRS の PICS (科学協力国際プログラム) により引き継がれました. 次の二つの特異点日仏シンポジウムがこの事業の結果です : 1998 年の札幌, 2002 年のマルセイユ. このシンポジウムは三番目のものです.

廣中平祐教授も日仏科学協力のシンボルです. 彼の業績はフィールズ賞, 1975 年の文化勲章などにより認められています. 廣中氏は我々二国間の科学協力の発展に継続的に尽くしておられます. 2004 年 1 月, フランス最高の栄誉であるレジオン・ドヌール勲章を受けられたのはこのためです.

日仏間の科学協力の力強さは一目瞭然です. 我々は堅実で実りある研究を発展させなければなりません. そして日仏間に存在する潜在能力は我々の科学協力を一層の推進させるでしょう. あなたがたはこのような協力の成功例です. フランスはあなたがたに感謝します.

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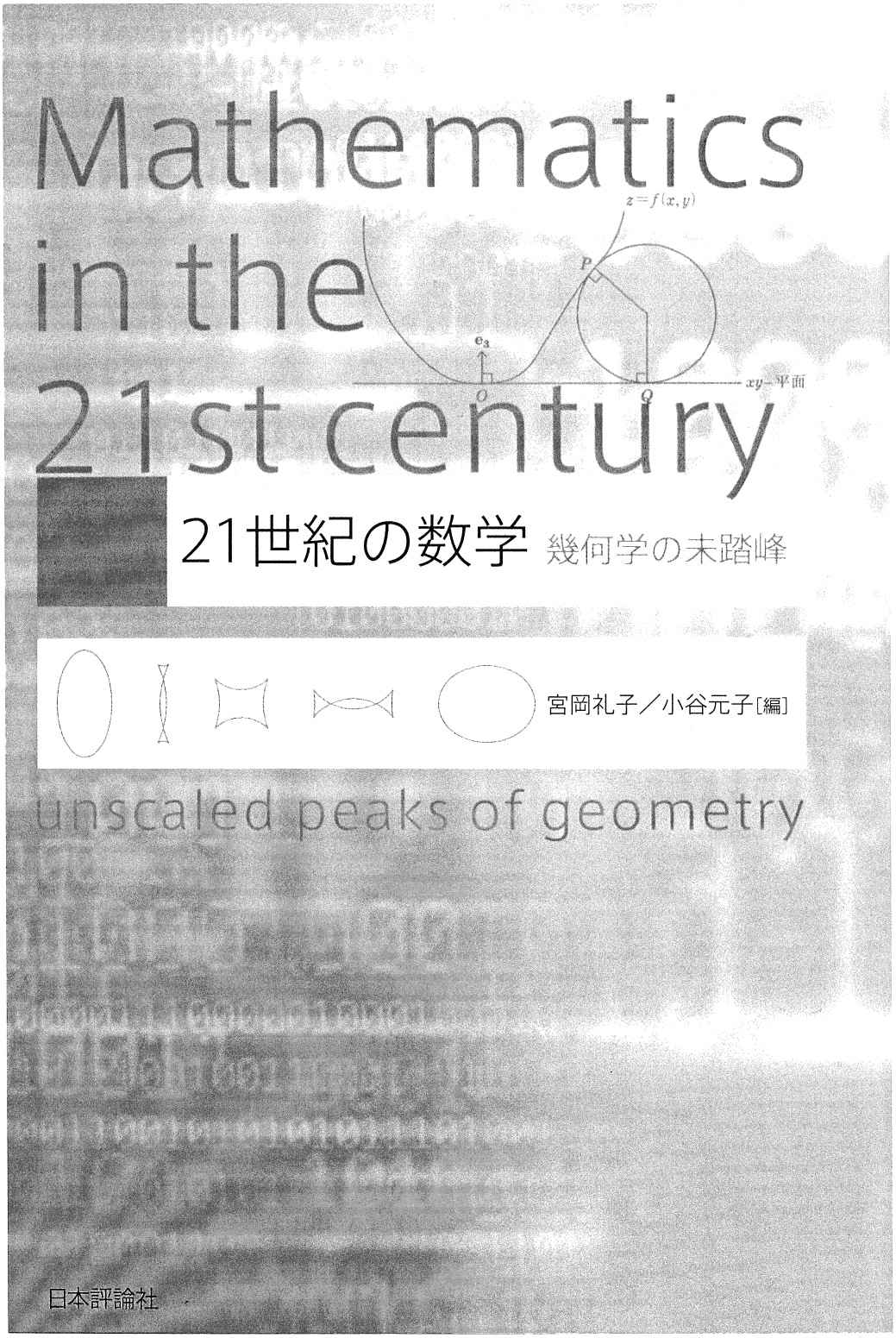

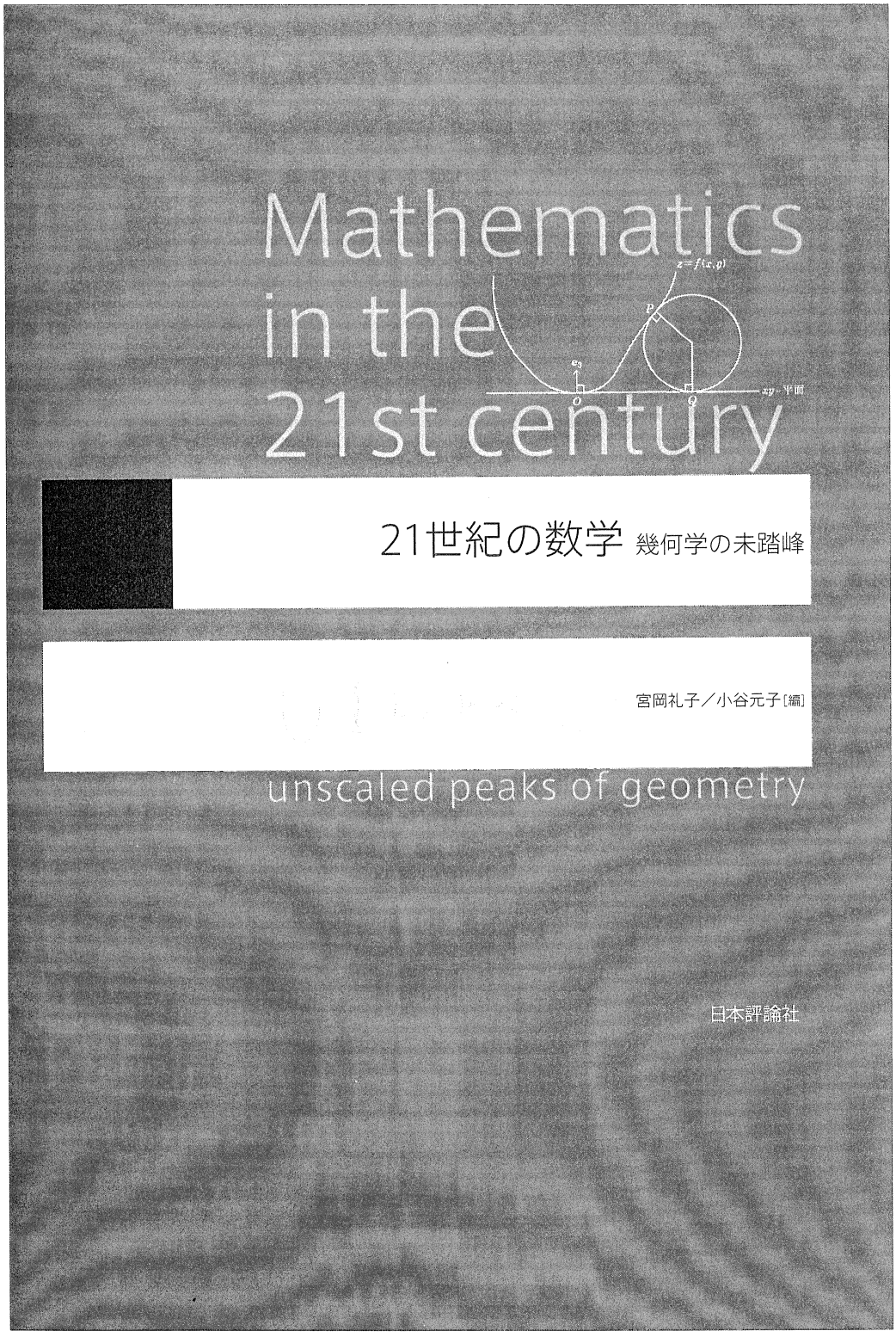
Mathematics
in the
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z=f(x,y)
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21世紀の数学 幾何学の未踏峰
宮岡礼子／小谷元子［編］
unscaled peaks of geometry
日本評論社

まえがき

数学をやっていると,「数学で解けてない問題なんてあるの？」ときかれることがあります．小学校，中学校で苦しめられた代数方程式や平面幾何を想定してのことでしょう．

この本にはまさに解けていない問題が，満載されています．その中には，解ければ学位に値するものや，フィールズ賞に値するものも含まれています．ですが，ひとつ注意があります．問題は本来自分で探すもの，ここにあげられた問題と解説はあくまでも指針です．特に前半の論説中には，リストアップされていない隠れた問題が行間にいくつも述べられています．じっくり読んで自分で問題を探してください．

出版に当たっては学部学生も手に取れる問題集というイメージがありました．この点について次のエピソードを紹介します．2002 年に「数理の翼夏期セミナー」の講師を仰せつかったときのことです．このセミナーは広中平佑氏が企画された[1)]，数学に限らず，最先端の科学をおもに高校生に紹介する合宿形式の活動で，参加者からは既に多くの数学者が育っています．さて，セミナーの講演前日に現地に到着すると，広中先生が開口一番,「やさしい話はしないでください，相手を高校生だと思わないでください」とおっしゃったのです．広中氏のこの言葉が本書の基本です．むずかしく手が届かなく思えても本物に触れることが重要だということです．

一方，実際本書に目を通してみると，1 つの解説が 10 ページ内外と適当な量のためか意外に (？) 読みやすく，またテーマの面白みの伝わってくる解説がたくさんあることを感じます．以下に少し紹介しましょう．

微分幾何学でも特異点を扱う問題が重要な位置を占めるようになってきました．

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1) 現在は NPO 法人数理の翼が主催しています．

扱う対象や目的は異なりますが，梅原氏，太田氏は特異性から不変量を探るというトピックを語っています．

小林亮一氏の解説は，幾何の人には後半から読む方が身近に思えるかもしれません．リーマン幾何学と統計力学との尋常ならざる深い関係が示唆されているという，ペレルマンの文献も引用されます．一方，黒瀬氏は成人式を迎えても大人になりきれない (？) 統計多様体について述べています．

藤木氏は，有名な S^6 には複素構造が入るかという問題から始め，複素幾何学の 30 題の問題を明解に解説しました．

二木氏は素人が読んでもきっと興味を覚えるに違いない美しい問題をあげています．森吉氏が述べる指数定理の役割は，非可換幾何学という新しい立場からも，二木氏のテーマや，二木不変量との関連が顔をのぞかせる興味深い話です．

塩濱氏は放射曲率という現在進行中のテーマの中で，若い院生たちの最新結果も多数とりあげました．

山口孝男氏は，いま最も興味がもたれているペレルマンのリッチ流を用いる 3 次元多様体の幾何化予想に関する話題を，この問題にとり組む第一線の著者自身の結果もあわせ，胸躍る解説としてのべています（書き手は冷静です）．加須栄氏による塩谷氏，山口氏の話題と関連する解説は読みやすく，良い導入になっているでしょう．

今野氏はスペシャル幾何学の中のハイパーケーラー多様体について語り，続く後藤氏の壮大な統一理論への興味をよび起こしてくれます．

佐武氏は，擬対称領域から定義される尖点特異点の幾何学的不変量とゼータ関数のある値の関係を予想し，整数論につながる特色のある内容になりました．長野氏の対称空間論は，対称 R 空間の創始者としての，本質をついた分かりやすい解説です．

芥川氏のブラックホールやトータルマスに関するペンローズ予想の解説は，数学の根底にある物理現象の解明に，極小曲面や逆平均曲率流といった幾何学的手法が重要な役割を果たすことを指摘しています．

そして深谷氏は，「若い人はこのレベルのものを一度ぐらいは解きたいと思って研究してほしい」と，53 題の問題に難易度 1～5 をつけて掲げました．どの問題も定義や背景を解説するだけで本になってしまうようなものですが，要所要所に

適切な文献があげられていて大変親切です.

その他スペースの都合ですべてを紹介できず残念ですが, いずれも熱意あふれる好編です. この本を手元におき, 折々にぜひ目を通してみてください.

本書の原型は 2003 年 8 月 21 日から 24 日にかけて, 北海道大学で開催された第 50 回幾何学シンポジウムの講演アブストラクトです. 2003 年が第 50 回の幾何学シンポジウムの年であることを小谷元子さんから指摘され, 記念企画として未解決問題を集めたらどうかとの具体的な提案もありました. さらに, シンポジウムでは最先端の研究者に問題提起とその解説をお願いして, 若い研究者の育成につなげようという話に進みました. 講演者にはあらかじめ記録集を残す可能性をお伝えし, アブストラクト段階から熱のはいった原稿をいただき, これをブラッシュアップしたのが本書です. 著者の方々に深く感謝するものです.

2002 年 12 月から 2003 年 10 月までは, インターネットを通じて未解決問題の公募が行われ, 小谷さんと, 名古屋大の内藤久資さん, 都立大の酒井高司さんの協力により, 100 題余の問題を集め, 整理することができました. 問題提出者に心より感謝します. これらは審査なしに掲載することを原則とし, また必ずしも提出者が初めて出した問題とは限らず, 昔からの有名な問題や, 多くの人の間で共通の問題とされているものも含んでいます. このほか 200 題をこえる問題が論説中にあげられており, 問題総数は 300 をこえるものとなっています.

シンポジウムの歴史については小林昭七氏の記事をお読みください. 氏がシンポジウムの経緯を詳細に調べられたのをきっかけに, 過去の講演者と講演題目を幾何学分科会ホームページに記録することになり, 福岡大の濱田龍義さんの協力により, 既に全ての記録が下記に掲載されています.

http://geom.math.metro-u.ac.jp/wiki/index.php?

また, 落合卓四郎氏の提案と協力により, 過去及び今後の講演要旨をすべて東京大学数理科学研究科図書室に集めることが実現しました. Survey シリーズについても準備中です[2)].

本書は 2003 年度の幾何学分科会幹事会メンバーを中心とする 7 名の編集委員

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2) ix ページを参照.

が編集しました．査読等で多くの方の協力を得たこと，西川青季氏（東北大）の資金援助，カバーデザインには山田光太郎氏（九州大），古畑仁氏（北海道大）の協力があったこと，また日本評論社の佐藤大器氏に大変お世話になりましたことを深く感謝します．最後に公募問題も含め，本書の内容についての責任は全て編集委員会が負うものといたします．（2004 年 5 月，宮岡礼子記）

8 招聘研究者

1. Tom Y. H. Wan (Chinese University of Hong Kong, 助教授), 2003 年 7 月 11 日 – 7 月 19 日, 2003 年 7 月 27 日 – 8 月 8 日, 2004 年 3 月 3 日 – 3 月 8 日.
2. Elisabetta Barletta (Università della Basilicata, 助教授), 2003 年 9 月 3 日 – 9 月 21 日.
3. Sorin Dragomir (Università della Basilicata, 教授), 2003 年 9 月 3 日 – 9 月 21 日.
4. Thomas K. K. Au (Chinese University of Hong Kong, 助教授), 2003 年 12 月 16 日 – 12 月 27 日.
5. Udo Simon (Technische Universität Berlin, 教授), 2004 年 2 月 27 日 – 3 月 10 日.
6. David Ruddy (Cornell University Library, Head of Systems Development and Production), 2005 年 1 月 21 日 – 1 月 29 日.
7. Philippe Tondeur (University of Illinois at Urbana-Champaign, 教授), 2005 年 1 月 21 日 – 2 月 3 日.
8. Richard Schoen (Stanford University, 教授), 2005 年 2 月 13 日 – 2 月 26 日.
9. Miguel Abreu (Instituto Superior Tecnico, 助教授), 2005 年 2 月 21 日 – 2 月 25 日.
10. Jingyi Chen (University of Britisch Columbia, 助教授), 2005 年 2 月 21 日 – 2 月 25 日.
11. Peter Topping (University of Warwick, 助教授), 2005 年 2 月 21 日 – 2 月 26 日.
12. Jiaping Wang (University of Minnesota, 助教授), 2005 年 2 月 21 日 – 2 月 26 日.
13. Anton Kratz (Technische Universität Berlin, PD), 2005 年 12 月 26 日 – 12 月 28 日.
14. Adela Mihai (University of Bucharest, 助手), 2006 年 1 月 13 日 – 2 月 22 日.
15. Eric Loubeau (Universite de Bretagne Occidentale, 講師), 2006 年 1 月 30 日 – 2 月 19 日.
16. Zejun Hu (Zengzhou University, 教授), 2007 年 1 月 6 日 – 1 月 19 日.
17. Huili Liu (Northeastern University, 教授), 2007 年 1 月 6 日 – 1 月 16 日.
18. Udo Simon (Technische Universität Berlin, 教授), 2007 年 1 月 6 日 – 1 月 19 日.
19. Yuguang Shi (Peking University, 教授), 2007 年 1 月 9 日 – 1 月 22 日.
20. Thomas Au (Chinese University of Hong Kong, 助教授), 2007 年 1 月 10 日 – 1 月 16 日.
21. Paul Baird (Universite de Bretagne Occidentale, 助教授), 2007 年 1 月 11 日 – 1 月 20 日.
22. Ali Fardoun (Universite de Bretagne Occidentale, 助教授), 2007 年 1 月 11 日 – 1 月 20 日.
23. Rachid Regbaoui (Universite de Bretagne Occidentale, 助教授), 2007 年 1 月 11 日 – 1 月 20 日.
24. Xiaohuan Mo (Peking University, 教授), 2007 年 1 月 12 日 – 1 月 18 日.

9 出版物送付先

9.1 Advanced Studies in Pure Mathematics, Vol. 33 – Vol. 46 送付先

発送先	機関名	所在地
1	名古屋大学大学院多元数理科学研究科	名古屋市千種区不老町
2	京都大学数理解析研究所	京都市左京区北白川追分町
3	バークレー数理科学研究所 Mathematical Sciences Research Institute	1000 Centennial Drive Berkeley. CA 94720 U.S.A
4	プリンストン高等数学研究所 The Institute for Advanced Study	Prinston. NJ 08540 U.S.A.
5	ハーバード大学 Birkhoff Mathematics Library Department of Mathematics Harvard University Science Center	One Oxford Street Cambridge, MA 02138 U.S.A.
6	I.H.E.S. Insititute des Hautes Etudes Scientifiques	91442 Bures-sur-Yvette France
7	マックスプランク数学研究所（ボン） Max-Planck Insititut für Mathematik	Gottfried-Claren Strasse 26 5300 Bonn 3 Germany
8	マックスプランク数学研究所（ライプチッヒ） Max-Planck Institut für Mathematik in den Naturwissenschaften	Inselstrasse 22–26 04103 Leipzing Germany
9	タタ基礎研究所 School of Mathematics Tata Insititute of Fundamental Research	Homi Bahabha Road Bombay 400005 India
10	ステクロフ数学研究所 Steklov Mathematical Institute Russian Academy of Sciences	42 Vavilov Street Moscow 117966, GSP-1 Russia
11	レニングラード大学 The Gorky Scientific Library St. Petersburg State University	Universiteskaya nab. 7/9 St. Petersburg 199164 Russia
12	南開数学研究所 Nannkai Institute of Mathematics Nannkai University	Tianzin People's Republic of China
13	ロシア自然科学アカデミー The Institute of Scientific Information Russian Academy of Sciences	Baltijskaya ul., 14 Moscow A-219 Russia

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15	マドラス数学研究所 The Institute of Mathematical Sciences	Madras 600113 India
16	ランダウ数理物理学研究所 Landau Institute for Theretical Physics Quantum Field Group	Moscow region, 142432 Chernogolovka Russia
17	復旦大学 Library Institute of Mathematics Fundan University	Shanghai 200433 People's Republic of China
18	香港中文大学 Gift & Exchange University Library The Chinese University of Hong Kong	Shantin, N.T. Hong Kong
19	北京大学 School of Mathematical Sciences Mathematical Library Peking University	Beijing 100871 People's Republic of China
20	ハノイ数学研究所 Institute of Mathematics Library Exchange Department	18 Hoang Quoc Viet Road 10307 Hanoi Vietnam
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9.2 Advanced Studies in Pure Mathematics, バックナンバー送付先

発送先	機関名	所在地
1	ベルリン工科大学 Technische Universität Berlin Fachbereich 3-Mathematik	Strasse des 17. Juni 136 D-10623 Berlin Germany

9.3 Advanced Studies in Pure Mathematics, Vol. 46 送付先

発送先	機関名	所在地
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9	東京理科大学理学部数理情報科学科	新宿区神楽坂 1-3
10	日本大学理工学部数学科	千代田区神田駿河台 3-11-2
11	千葉大学理学部数学・情報数理学科	千葉市稲毛区弥生町 1-33
12	筑波大学大学院数理物質科学研究科 数学専攻	つくば市天王台 1-1-1
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16	龍谷大学理工学部数理情報学科	大津市瀬田大江町横谷 1-5
17	近畿大学理工学部理学科	東大阪市小若江 3-4-1
18	大阪大学大学院理学研究科数学専攻	豊中市待兼山 1-16
19	神戸大学理学部数学教室	神戸市灘区六甲台町 1-1
20	岡山大学理学部数学教室	岡山市津島中 3-1-1
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